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INTRODUCTION

PURPOSE

The purpose of these technical guides is to help implement the requirements of GSA's environmental process. The technical guides contain technical information, recommendations, and options for achieving adequate levels of safety required in GSA space. They also contain guidance and criteria statements and applicable federal requirements.

APPLICABILITY

Technical guides apply to all organizational elements of GSA. The recommendations in the technical guides are intended to protect GSA personnel and property, occupant agencies, and the visiting public in Government-owned buildings and leased space under the control of GSA. This includes buildings and spaces where client agencies have delegation of operational and/or leasing authority.

S&EM PROGRAM OBJECTIVES

GSA's environmental process exists to:

- o Provide a safe and healthful work environment for Federal employees and the visiting public;
- o Protect Federal real and personal property;
- o Ensure client agency mission continuity; and
- o Provide reasonable safeguards for emergency forces if an incident occurs.

Meeting these objectives is not always an easy task, considering that:

- o GSA owns and leases more than 7,800 buildings.
- o Each of these buildings is unique and has its own safety needs.

GSA HANDBOOK PBS P 5900.2C

Prior to February 10, 1992, **S&EM Division policy**, requirements, and recommendations were included in GSA Handbook PBS P 5900.2C. On that date, the handbook was divided into several different documents. The handbook was condensed and reissued as Instructional Letter PBS IL-92-4 then as the Property Management Business Practice Handbook. The Environmental Management

Technical Guides provide technical information, recommendations and requirements similar to that formerly found in PBS P 5900.2C.

Property Management Business Practice Handbook (draft)

The Property Management Business Practice Handbook contains the core practices and requirements which regions must follow. GSA develops environmental practices based on Federal regulations and executive orders, research data, technological advancements, historical data, and field experience. In addition to ensuring workplace and occupant safety, GSA also develops practices which ensure the cost effective protection of Federal assets. Regional offices develop their own program to implement the practices and requirements.

USING TECHNICAL GUIDES

The Environmental Management technical guides contain recommendations and Federal requirements. However, regional offices do have flexibility. A region may implement a guideline or procedure which provides an equivalent or greater level of safety than the technical guide recommendation does.

The technical guides are divided into the following parts:

- **Background**
The "Background" provides a short refresher on the topic, and states GSA environmental practices.
- **Discussion**
The "Discussion" details the technical guide topic and related issues.
- **Requirements and Recommendations**
The "Requirements and Recommendations" contain applicable requirements and suggestions for achieving the minimum level of safety required in GSA space. Regions are not required to follow the suggestions, but they must provide a level of safety at least equivalent to that provided in the technical guide.
- **References**
Additional information is sometimes needed before a risk-based engineering decision can be made. The "References" contain some sources of additional information.

REGUALTION AND STANDARDS

Federal Regulations

Federal laws, regulations and Executive Orders, which are cited in the technical guides, form the basis for the scope and direction of the GSA environmental program. The GSA safety program is based on compliance with their provisions.

Consensus Standards

The majority of specific safety recommendations in the technical guides are adopted by reference to consensus codes, standards and guidance developed by groups such as the National Institute for Standards and Technology (NIST), the American National Standards Institute (ANSI), and National Institute of Building Sciences (NIBS), for example. If a region chooses to deviate from a recommended standard, the region must show that their alternative decision provides at least an equivalent level of safety.

NUMBERING SYSTEM

Technical guides are numbered at the top of every page. The numbers indicate the topic and date of issue. For example, the number E201.0395 indicates:

- E - Environmental management technical guide (Fire protection engineering technical guides begin with "F".
- 201 - The topic is "Hazardous Waste."
- 03 - The technical guide was issued in March
- 95 - The technical guide was issued in 1995.

FUTURE TECHNICAL GUIDES

Technical guides will be revised and additional subjects added as their need is identified. Recommendations or suggestions for modifications or additional information and instructions that will improve the technical guides or new technical guide topics are invited and should be submitted through the appropriate channels to the environmental team at Central Office.

E101.0395 **Technical Guide**

ASBESTOS MANAGEMENT RESPONSIBILITIES

BACKGROUND

GSA minimizes asbestos exposures by all building occupants through managing asbestos in place where it is in good condition, and promptly abating the excess risk from asbestos which is damaged or subject to disturbance by routine operations or planned renovation.

DISCUSSION

GSA's asbestos management program complies with federal regulations and guidance, including the:

General Services Administration's Federal Property Management Regulations.

Occupational Safety and Health Administration's (OSHA's) standards for asbestos construction and hazard communication.

Environmental Protection Agency's (EPA's) asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP) regulation.

Department of Transportation (DOT's) Hazardous Material Regulations.

Applicable State and local environmental regulations.

GSA follows EPA guidance in its:

"Purple Book" on overall management and control of asbestos in buildings, and

"Green Book," on asbestos-related operations and maintenance (O&M) programs.

REQUIREMENTS AND RECOMMENDATIONS

GSA staff at the Central, regional and property management centers develop and implement asbestos program elements under their purview.

Public Buildings Service

The Commissioner, Public Buildings Service, as the GSA Asbestos Program Manager, is responsible for the implementation of the asbestos program in GSA-controlled facilities.

Office of Property Manaclement: Develops basic asbestos management and abatement program documents, and technical and managerial guidance information on asbestos, and reviews their implementation in GSA-controlled facilities.

Office of the Commercial Broker: In coordination with Office of Property Management, issues and reviews implementation of programs on asbestos through guide acquisition documents for real property acquisition, including leasing, purchase, site acquisition and easements, and guidance on asbestos issues in administering acquired space.

Office of Fee Developer. In coordination with Office of Property Management, issues and reviews implementation of programs on asbestos through documents on facility standards for construction, prospectus development studies, acquiring sites, and the design, procurement and construction of new construction and renovation activities.

Office of Property Disposal: Obtains and disseminates all reasonably available or ascertainable information, including removal time and cost estimates, about asbestos in facilities being disposed of by holding agencies.

Federal Supply Service

The Federal Supply Service does not receive, store, or ship ACM. It purchases asbestos-containing material (ACM) only in solid matrix form or in other form upon special order, shipping such products directly from the supplier to the client agency; transfers excess or surplus ACM in solid matrix form in a condition or package precluding release of asbestos fibers; and disposes of other (friable or damaged) ACM in accordance with EPA regulations and guidelines.

Information Technology Service

The Information Technology Service coordinates installation, alteration and repair of telecommunications equipment in GSA-controlled facilities having ACM with the Public Buildings Service.

Heads of Staff Offices

Heads of Staff Offices develop and implement the asbestos program in their offices in coordination with the Public Buildings Service.

Regional Offices

The Regional Administrator develops and implements the overall asbestos program in the region. The Assistant Regional Administrator for Public Buildings Service, as the regional Asbestos Program Manager, implements the asbestos program in regional facilities.

Property Management Centers

The Property Management Center's Customer Service Representative designates an Asbestos Program Manager responsible for the implementation of the asbestos program for each facility with ACM.

Client Agencies

Client agencies in GSA-controlled space with ACM are responsible for the actions of their employees and contractors, for complying with applicable health and safety regulations and the GSA asbestos management program for their space.

In delegated space, the delegated agency designates an Asbestos Program Manager who implements the asbestos management program for the space, and is the liaison with GSA delegation officials and safety and health officials regarding asbestos.

REFERENCES

U.S. Environmental Protection Agency. *Guidance for Controlling Asbestos Containing Materials in Buildings*. EPA 560/5-85-024. June 1985. (The "Purple Book")

U.S. Environmental Protection Agency. *Managing Asbestos in Place*. T-2003. July 1990. (The "Green Book")

U.S. Environmental Protection Agency. Asbestos Hazard Emergency Response Act (AHERA) regulations. 40 CFR 763.80-99.

U.S. General Services Administration. Federal Property Management Regulations. 41 CFR 101. In particular, sections 101-20.002-1 (k) and 101-20.101 (d)

U.S. Occupational Safety and Health Administration. Asbestos construction standard. 29 CFR 1926.58

U.S. Occupational Safety and Health Administration. Hazard communication standard. 29 CFR 1926.59.

U.S. Department of Transportation. Hazardous Material Regulations. 49 CFR 171-180.

ASBESTOS INSPECTION AND ASSESSMENT

BACKGROUND

GSA minimizes asbestos exposures by all building occupants through managing asbestos in place where it is in good condition, and promptly abating the excess risk from asbestos which is damaged or subject to disturbance by routine operations or planned renovation.

DISCUSSION

Inspection and assessment of asbestos-containing materials (ACM) are important components of GSA's asbestos management program. These are performed in conjunction with abatement (encapsulation, enclosure, removal or repair) of known and suspected ACM which is damaged or subject to disturbance, and with asbestos operations and maintenance programs.

REQUIREMENTS AND RECOMMENDATIONS

GSA complies with federal regulations, including those of the Environmental Protection Agency (EPA), Occupational Safety and Health Administration and the Department of Transportation, and with applicable State and local environmental regulations.

GSA follows EPA's "Purple Book" guidance on overall management and control of asbestos in buildings.

GSA follows EPA's "Green Book" guidance on asbestos-related operations and maintenance (O&M) programs.

GSA follows EPA guidance on strategies on inspection for and assessment of ACM, based on EPA regulations under the National Emission Standard for Hazardous Air Pollutants (NESHAP) and Asbestos Hazard Emergency Response Act (AHERA).

GSA follows EPA regulations and guidance under the Asbestos School Hazard Abatement Reauthorization Act on the inspection, assessment and abatement of ACM by accredited persons.

Because of GSA's interest in maintaining its buildings for long periods and because of frequent renovations, building-wide asbestos inspections and reinspections should include visual inspection of exterior and other selected suspect ACM, such as roofing and shingles, with bulk sampling of those materials at representative damaged locations, if any exist, as well as inspection and sampling of other suspect materials using AHERA criteria. Periodic surveillance of ACM should be performed between reinspections.

REFERENCES

U.S. Environmental Protection Agency. *Guidance for Controlling Asbestos Containing Materials in Buildings*. EPA 560/5-85-024. June 1985. (The "Purple Book")

U.S. Environmental Protection Agency. *Managing Asbestos in Place*. T-2003. July 1990. (The "Green Book")

U.S. Environmental Protection Agency. *Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials*. EPA 560/5-85-030a. October 1985. (The "Pink Book")

U.S. Environmental Protection Agency. National Emission Standards for Hazardous Air Pollutants (NESHAP): Asbestos. Title 40, Code of Federal Regulations (CFR), Part 61, Subparts A and M. (Note Section 145, Standard for demolition and renovation, paragraph (a), Applicability.)

U.S. Environmental Protection Agency. *A Guide to the Asbestos NESHAP as Revised November 1990*. EPA 340/1-90-015. November 1990.

U.S. Environmental Protection Agency. *Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance*. EPA 340/1-90-018. December 1990.

U.S. Environmental Protection Agency. Asbestos Containing Materials in Schools. 40 CFR 763, Subpart E. (Enacted under the Asbestos Hazard Emergency Response Act (AHERA), Public Law 99-519.)

U.S. Environmental Protection Agency. *100 Commonly Asked Questions about the New AHERA Asbestos-in-Schools Rule*. May, 1988. (Available from the EPA through its Toxic Substances Hotline, 202-554-1404.)

U.S. Environmental Protection Agency (EPA). *A Guide to Performing Reinspections under the Asbestos Hazard Emergency Response Act (AHERA)*. EPA 700/B-92/001. February 1992.

Asbestos School Hazard Abatement Reauthorization Act (ASHARA). Public Law 101-637. 104 Statutes 4589-4598. November 28, 1990. (Note Section 15, Asbestos Abatement Training Amendments, which extends AHERA to public and commercial buildings.)

Commissioner, Public Buildings Service. Memorandum for Regional Administrators: Asbestos Policy for Leased Space. November 21, 1986. (Attached was Instructional Letter PQP-86-06.)

Assistant Commissioner for Real Property Development. Memorandum for All Real Property Leasing Activities: Asbestos Criteria Revisions to the Solicitation for Offers. Instructional Letter PQP-86-06. November 21, 1986.

Assistant Commissioners for Real Property Management and Safety, and Real Property Development. Memorandum for All Real Property Leasing Activities: Safety and Environmental Procedures in Lease Acquisition. Instructional Letter PQRP-91-05. September 23, 1991.

Assistant Commissioner for Real Property Management and Safety. Memorandum for Assistant Regional Administrators for Public Buildings Service. Implementing EPA Asbestos Renovation Requirements. December 23, 1991.

Assistant Commissioner for Real Property Management and Safety. Memorandum for Assistant Regional Administrators for Public Buildings Service. Asbestos Regulation Revision and Information. April 23, 1991.

Assistant Commissioner for Real Property Management and Safety. Memorandum for Assistant Regional Administrators for Public Buildings Service. GSA Asbestos Reinspection Guidance. May 28, 1992. Includes GSA adaptation of EPA reinspection guide.

Assistant Commissioner for Real Property Management and Safety. Memorandum for Assistant Regional Administrators for Public Buildings Service. Asbestos Inspection Guide Specification Package. August 27, 1992. Addresses initial inspections, physical surveillance, reinspections and abatement project inspections, based on AHERA.



Environmental Management

E103.0395

Technical Guide

ASBESTOS AND SPACE ACQUISITION AND DISPOSAL

BACKGROUND

No asbestos-containing materials (ACM) are to be used in new construction, renovation or repair of space owned by GSA. GSA does not acquire space with ACM through purchase, exchange or transfer. GSA uses a ranking system to evaluate asbestos with respect to space offered for lease.

DISCUSSION

GSA implements its space acquisition practice through building construction, purchase and leasing. GSA follows Environmental Protection Agency (EPA) guidance including the EPA'S:

"Purple Book" on overall management and control of asbestos in buildings, and

"Green Book," on asbestos-related operations and maintenance (O&M) programs.

The GSA Handbook, Facilities Standards for the Public Buildings Service, provides design guidelines and criteria for new buildings and renovations, whether GSA-owned or leased. (For leased space, building designs must comply with all local codes and ordinances which may supersede the Handbook's criteria.)

The GSA Instructional Letters and Acquisition Letters provide instructions, procedures and language for Solicitations for Offers (SFOs). The language includes general clauses (GSA Forms 3517, 3517A and 3517B), Representations and Certifications (GSA Form 3518), U.S. Government Lease for Real Property (Short Form) (GSA Form 3626), and standard SFO text.

PROGRAM ELEMENTS

GSA as a Holding Agency

GSA does not acquire space with ACM through purchase, exchange or transfer.



GSA does not use ACM in new construction, renovation or repair of space owned by GSA.

GSA as a Leasing Agency

Space to be acquired by lease (such as a new, existing, succeeding or superseding lease, renewal option or expansion agreement) is evaluated before acquisition.

Each offeror of 10,000 square feet (sf) of space or more (20,000 sf of warehouse space), for a new lease, lease extension, lease renewal, or lease expansion, exceeding 6 months, certifies the type and condition of ACM, and the Safety and Environmental Management Branch/Division performs a risk-based survey. A ranking system is used to evaluate space to determine whether it may be leased. Space of a lower choice may be leased only if no space of a higher choice is available.

- o First choice is for space without ACM, or space with ACM for which:
 - oo The asbestos is bound in a solid matrix form (e.g., undamaged vinyl asbestos flooring or asbestos cement panels),
 - oo The ACM is not damaged or subject to disturbance by routine operations, and
 - oo The offeror agrees to implement an asbestos operations and maintenance program conforming to EPA guidance.
- o Second choice is for space with thermal system insulation (e.g., pipe wrapping or boiler lagging) ACM for which:
 - oo The ACM is not damaged or subject to disturbance by routine operations, and
 - oo The offeror agrees to implement an asbestos operations and maintenance program conforming to EPA guidance.
- o Space with ACM of any other type or condition may be considered if:
 - oo The Offeror certifies that such ACM will be abated (removed, enclosed, encapsulated or repaired) so the space will be first or second choice before Government occupancy, and,
 - oo After acceptance of the offer, the Lessor:

- ooo Certifies successful abatement completion before occupancy,
- ooo Provides evidence that the space meets GSA asbestos reoccupancy requirements before occupancy, and
- ooo Implements an asbestos operations and maintenance program conforming to EPA guidance for any remaining ACM.

A small space (less than 10,000 sf (20,000 sf for warehouses)), or a space leased for 6 months or less may have ACM bound in a solid matrix form (e.g., undamaged vinyl asbestos flooring or asbestos cement panels) in the space, or undamaged boiler or pipe insulation outside the space. For a small space, or a space below grade or on the third or higher floor, the Offeror completes a safety and environmental management prelease certification checklist, which addresses the categories and conditions of ACM. For a small space with ACM, the lessor implements an asbestos operations and maintenance program conforming to EPA guidance.

The space may be inspected during the offering period and, upon acceptance, during the lease. GSA may, upon reasonable notice, inspect the space and all other areas as necessary, including:

- o Inspecting suspected asbestos-containing materials (including visual and physical inspection and bulk sampling and analysis),
- o Air monitoring for asbestos fibers, and
- o Inspecting the heating, ventilation and air conditioning system, maintenance records and mechanical rooms for the space.

For lease expansions, checklists and surveys are not required if the expansion is 10% or less, the total expanded space will be 1 1,000 sf (22,000 sf for warehouses) or less, or the expansion space meets the safety and health requirements of the existing lease of 10,000 sf (20,000 sf for warehouses) or more.

GSA as a Disposal Agency

Holding agencies must provide the regional Public Buildings Service's Property Disposal Division with all reasonably available or ascertainable information, including removal time and cost estimates, about asbestos in facilities planned for disposal.

For GSA-controlled real property planned to be excessed, the Public Buildings Service discloses all of GSA's known information on asbestos to the regional Property Disposal Division in the report of excess submitted to the Division. The Division redeploys properties excessed in accordance with the Federal Property Management Regulations.

The Division may coordinate with the regional safety and environmental staff to verify the asbestos information it has received.

REFERENCES

U.S. Environmental Protection Agency. *Guidance for Controlling Asbestos Containing Materials in Buildings*. EPA 560/5-85-024. June 1985. (The "Purple Book")

U.S. Environmental Protection Agency. *Managing Asbestos in Place*. T-2003. July 1990. (The "Green Book")

U.S. General Services Administration. Federal Property Management Regulations - Utilization and Disposal of Real Property. Title 41, Code of Federal Regulations, Part 101-47.

U.S. General Services Administration.

- General Clauses (Acquisition of Leasehold Interests in Real Property). (GSA Form 3517).
- General Clauses (Acquisition of Leasehold Interests in Real Property Not To Exceed \$25,000). (GSA Form 3517A).
- General Clauses (Acquisition of Leasehold Interests in Real Property Over \$25,000 and Less Than 10,000 Square Feet or Any Lease Not To Exceed 6Months). (GSA Form 3517B).
- Representations and Certifications (GSA Form 3518).
- U.S. Government Lease for Real Property (Short Form) (GSA Form 3626)

Assistant Commissioners for Real Property Management and Safety, and Real Property Development. Memorandum for All Real Property Leasing Activities: Safety and Environmental Procedures in Lease Acquisition. Acquisition Letter PQRP-91-05. September 23, 1991. Includes SFO instructions and language.

Commissioner, Public Buildings Service. Memorandum for All Real Property Leasing Activities: Expedited Procedures for Acquisition of Leasehold Interests in Real Property. Acquisition Letter PQRP-91-04. August 26, 1991. Includes streamlined procedures for most leasing actions of less than 10,000 sf and/or 6 months.

Director, Real Estate Policy Division. Memorandum for Regional Real Estate Division Directors: New GSA Leasing Forms. September 18, 1992.

Commissioner, Public Buildings Service. Facilities Standards for the Public Buildings Service. PBS/PQ-100. February 28, 1992. Describes requirements for GSA space.

Technical Guide

ASBESTOS COMMUNICATION

BACKGROUND

GSA promotes openness in communication with customers, regulatory agencies, the public, and other parties during all stages of asbestos-related repair, renovation and abatement projects. Figure 1, Asbestos Communication Program, summarizes communications elements at each stage.

DISCUSSION

GSA's asbestos communication program complies with federal regulations and guidance, including the:

General Services Administration's Federal Property Management Regulations.

Occupational Safety and Health Administration's (OSHA's) standards for asbestos construction and hazard communication.

Environmental Protection Agency's (EPA's) guidance in its "Purple Book" (on overall management and control of asbestos in buildings), "Green Book," (on asbestos-related operations and maintenance (O&M) programs), and "100 Commonly Asked Questions about the New AHERA Asbestos-in-Schools Rule" and related Asbestos Hazard Emergency Response Act (AHERA) publications.

Department of Transportation (DOT's) Hazardous Material Regulations.

Applicable State and local environmental regulations.

REQUIREMENTS AND RECOMMENDATIONS

GSA staff at the Central, regional and property management centers develop and implement asbestos communication program elements under their purview.

Public Buildings Service

The Commissioner, Public Buildings Service, and Assistant Commissioner for Property Management issue business practices and implementing guidance on safety and environmental abatement communication. The Assistant Commissioner assesses regional program implementation through ongoing performance evaluations.

Regional Offices

The Regional Administrator develops and implements the overall program in the region. The Assistant Regional Administrator for Public Buildings Service implements the program in regional facilities.

Property Management Centers

The Asbestos Program Manager for each facility with Asbestos Containing Material (ACM) is responsible for the implementation of the program in that facility.

Customer Agencies

Customer agencies in GSA-controlled space with ACM are responsible for the actions of their employees and contractors, for complying with the GSA asbestos communication program for their space. Customer agencies are encouraged to communicate about asbestos issues with their employees in the manner provided in their operational and personnel regulations.

In delegated space, the delegated agency's Asbestos Program Manager implements the asbestos communication program for the space.

REFERENCES

U.S. Environmental Protection Agency. *Guidance for Controlling Asbestos Containing Materials in Buildings*. EPA 560/5-85-024. June 1985. (The "Purple Book")

U.S. Environmental Protection Agency. *Managing Asbestos in Place*. T-2003. July 1990. (The "Green Book")

U.S. Environmental Protection Agency. *100 Commonly Asked Questions about the New AHERA Asbestos-in-Schools Rule*. May, 1988. (Available from the EPA through its Toxic Substances Hotline, 202-554-1404.)

U.S. Environmental Protection Agency. Asbestos Hazard Emergency Response Act (AHERA) regulations. 40 CFR 763.80-99.

U.S. General Services Administration. Federal Property Management Regulations. 41 CFR 101. In particular, sections 101-20.002-1 (k) and 101-20.101 (d).

U.S. Occupational Safety and Health Administration. Asbestos construction standard. 29 CFR 1926.58.

U.S. Occupational Safety and Health Administration. Hazard communication standard. 29 CFR 1926.59.

U.S. Department of Transportation. Hazardous Material Regulations. 49 CFR 171-180.

Asbestos Communication Program

1. **Practice.** The General Services Administration (GSA) promotes openness in communication with customers, regulatory agencies, the public, and other parties during all stages of asbestos-related repair, renovation and abatement projects. Figure 1, Overview of Asbestos Communication Program, summarizes communications elements at each stage.

2. **PROJECT STAGES.** Regional and property management center staff involved with a project should identify major project stages requiring significant communication efforts, whether the project is funded by prospectus, the region, or the property management center. Project stages include some or all of the following:

- a. Building asbestos survey and assessment (par. 5).
- b. Building Engineering Report (BER) (par. 6).
- c. Prospectus Development Study (PDS) (par. 7).
- d. Project development and funding (par. 8).
- e. Project design (par. 9).
- f. Major project design evolution and revisions (par. 10).
- g. Construction (par. 11).

(Note: Par. 12 contains a list of abbreviations.)

3. **Communication elements.** At each project stage, the regional and property management center staff involved should identify major elements of the communication process appropriate for that stage. This document contains a detailed set of communication elements to assist the regions technically in implementing communication programs. Building managers lead the project communications activities, and are supported by property management center and regional staff (Safety and Environmental Management, Design and Construction, etc.) as required for the performance of the project. Some elements may not be required for all projects. Similarly, the region may wish to tailor the elements in this document or develop alternate communication elements to meet specific project conditions.

The main asbestos project communication elements are described in the subheadings for each stage:

- a.** Information topics.
- b.** Primary audiences.
- c.** Asbestos information presentation and question response.
- d.** Presentation methods.

Figure 1. Overview of Asbestos Communication Program

	Topics	Audience	Methods
Asbestos Survey	1	6	8
BER	2	6	8
PDS	3	6	8
Project Development	3	6	8
Project Design	4	7	8
Design Revision	4	7	8
Construction	5	7	9

1 = Presence of asbestos in the building, GSA asbestos policy, implementation of an asbestos operations and maintenance program, requirements for asbestos controls of alterations, survey limits.

2 = Scope of BER, variations between BER proposals and resulting projects, entry of A/E teams into customer agency space.

3 = Scope of PDS, plans to avoid or minimize common problems.

4 = Planned design phases, need for customer agencies to inform GSA of other projects or changes affecting this project, major design changes, entry of A/E teams into customer agency space.

5 = Asbestos plan of action, inspection/monitoring program, clearance notification program, contingency plan, potential disruptions, need for customer agencies to inform GSA of other projects or changes affecting this project, major design changes.

Figure 1. Overview of Asbestos Communication Program
(continued)

6 = Customer agency management and affected PBS staff.

7 = Customer agency management and employees, Customer Service Representative's staff, other contractors at the building.

8 = Letter or meeting with agency heads; visual aids may be used.

9 = Letters or meetings with agency heads, project staff and employees **as** needed. Visual aids and signs may be used; air monitoring/clearance results often posted. Phone notification, especially when reoccupancy is not allowed.

4. **Affected parties.** At each project stage, regional and property management center staff should identify parties affected by the work at that stage in order to prepare for information presentation and discussion. The parties may include, but are not limited to:

a. **GSA staff.** This includes staff involved with project design and construction management in the Fee Developer, Property Management, Portfolio Manager, and affected GSA unions and employee associations. The Asbestos Program Manager (APM), who is typically the Property Management Center's Customer Service Representative, leads the presentation. of communications with customer agencies.

b. **GSA prooect contractors.** These include architectural/engineering (A/E) contractors, typically contracted by the Fee Developer or the Portfolio Manager; industrial hygiene (IH) contractors, typically contracted by the Fee Developer, the A/E, and/or the Safety and Environmental Management staff (S&EM); and other subcontractors to the A/E or IH contractors.

c. **Building customer agencies.** These include senior management at the building, facility management staff; employees, local Federal Executive Associations and similar organizations. In customer-delegated buildings, the delegated agency's facility manager assumes most communication responsibilities held by the GSA Customer Service Representative for GSA-managed facilities. GSA staff may offer, in discussions with customer agency management, to provide information to customer agencies' staff, without interfering with their management/union/employee relations. Customer agency management may be expected to share information with its employees, using its internal methods. Customer agency employees often share information among themselves and with employees of other agencies.

d. **Other contractors at the buildings** These include custodial, maintenance, utility or computer services ' commercial facility management, and repair and alteration construction, whether contracted by GSA or customer agencies, communication system services contracted by the Information Technology Service or customer agencies, asbestos abatement contractors already at the building for other projects, etc.

e. **Regulatory agencies.** These include the Environmental Protection Agency and the Occupational Safety and Health Administration, or the state and/or local agencies administering environmental and/or occupational safety and health regulations.

f. **The public.** This includes building visitors, news media, and building neighbors.

5. Building asbestos survey(s) and assessments.**a. Information topics:**

(1) The presence of asbestos-containing materials (ACM) in the building.

(2) GSNs practice of managing asbestos in place where it is in good condition, and abating (removing, encapsulating, enclosing or repairing) ACM which is damaged or subject to damage by routine operation or planned renovation.

(3) The implementation of an asbestos-related operations and maintenance program.

(4) The locations of sprayed-on or troweled-on surfacing ACM, thermal system insulation ACM, and miscellaneous forms of ACM and the locations of ACM that may be subject to physical disturbance.

(5) The applicable requirements for asbestos control for alterations (to be provided to each customer agency with the authority to make alterations to the space it occupies).

(6) Limitations of the asbestos assessment. Some hidden ACM may not be known until a subsequent maintenance or renovation project or other disturbance reveals its presence. Suspect materials not previously sampled must be sampled before planned demolition or disturbance. If unexpected ACM or asbestos conditions are encountered, control measures will be implemented.

b. Primary audiences: GSA staff and the head of each customer agency in the building or scheduled to move into the building or to a different space in the building (coordinated through the Portfolio Manager or other relocation manager), at the time of the survey or thereafter.

c. Asbestos information presentation and question response: The Asbestos Program Manager (APM; typically the Property Management Center's Customer Service Representative leads these activities, supported by property management center and S&EM staff.

d. Presentation methods:

(1) Usually the Customer Service Representative writes to customer agency heads, after being advised of the assessment results by the APM (if not the Customer Service Representative) and Customer Service Representative. Occasionally, a meeting with customer agency heads, facility managers and/or employees will be held; if so, this is usually led by the Customer Service Representative and attended by the APM (if not the Customer Service Representative), who presents the asbestos findings, and, optionally, S&EM staff or consultants. Staff managing the inspection shall keep the Customer Service Representative apprised of its status and of communication with customer agencies, such as for gaining access to their space.

(2) Visual aids, such as flyers, newsletters, posters, signs and bulletin boards, agency-wide, regional and/or building-specific slide shows or videotapes, may be helpful; these are provided from building management funds.

6. **Building Engineering Report (BER)**

a. **Information topics:**

(1) A BER is an engineering review of the building and its equipment and systems.

(2) Customer agencies should be informed in advance that A/E review teams will be in their building for the evaluation, inspecting the space, and discussing their program and space requirements and plans.

(3) Caution should be used in describing BERs and their use, because the resulting projects commonly vary considerably from the BER proposals in both priority and scope. Limitations of the asbestos portion of the BER should also be addressed [see building survey information, par. 5a(6)].

b. **Primary audiences:** Customer agency management, the Planning and Project Review Board (PPRB), Property Management, the Fee Developer, Portfolio Manager, and Planning staff.

c. **Asbestos information presentation and question response:** The APM leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Planning staff.

d. **Presentation methods:** Usually the Customer Service Representative will write to customer agency heads, after being advised by the APM (if not the Customer Service Representative) and the BER manager in the Portfolio Manager (who may be the Contracting Officer Representative for the BER contract). Occasionally a meeting with customer agency heads, facility managers and/or employees will be held; if so, this is usually led by the Customer Service Representative and attended by the APM (if not the Customer Service Representative), who presents the asbestos findings, and, optionally, S&EM staff or consultants and the Portfolio Manager. Visual aids may be used [see presentation methods, par. 5d(2)]. The BER manager shall keep the Customer Service Representative apprised of its status and of communication with customer agencies.

7. Prospectus Development Study (PDS).

a. Information topics:

(1) A PDS is a study which organize@ the concepts for major renovation or new construction projects in a standard format to present to Congress for line-item funding.

(2) GSA's asbestos business practice [see par. 5a(2)] should be reiterated.

(3) Information for obtaining concurrence by customer agencies with the proposed project scope at this stage as it affects their space, and GSA's proposed project methodology.

(4) Customer agencies and GSA should work to minimize or avoid common problems. Experience has indicated several common problem subjects; attention should be given to anticipating and, thereby, avoiding: excessive customer hopes (that project will be done quickly, or as initially conceived, etc.); disappointment that decisions in this stage are not final- premature inducement of a high level of customer activity; confusion from different plans among different customers for reasons justified within GSA but not evident or acceptable to the customers; confusion from variations in project design development, such as among drafts and the final PDS, and, later, among versions of the funding and design documents (some customers may believe these variations indicate excessive GSA uncertainty, rather than sensitivity to addressing project-related issues); becoming locked into a single project approach; excessive reliance on the details of the asbestos portion of the PDS [see asbestos survey limitations, par. 5a(6)].

b. Primary audiences: Customer agency management, the PPRB, and the Fee Developer.

c. Asbestos information presentation and question response: The APM leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer, Portfolio Manager and Planning staff, and, as appropriate, the regional spokesperson.

d. Presentation methods: Usually the Customer Service Representative will write to customer agency heads, after being advised by the APM (if not the Customer Service Representative) and the manager of the PDS. Meetings with customer agency heads, facility managers and/or employees may be held; if so, they are usually led by the Customer Service Representative and attended **by** the APM (if not the Customer Service Representative), who presents the asbestos findings, and, optionally, S&EM staff or consultants, the Portfolio Manager and the Fee Developer. Visual aids may be used [see presentation methods, par. 5d(2)]. The PDS manager shall keep the Customer Service Representative apprised of its status and of communication with customer agencies.

8. Project development and funding.**a. Information topics:**

(1) Most of the Information provided here is similar to that provided during PDS development [see par. 7a].

(2) In addition, progress statements are appropriate at major funding steps, such as the submission of the prospectus to Congress; approval of the prospectus and any significant changes to its scope or funding; appropriation of funds, whether the project is of prospectus-level or smaller, again describing any significant changes to its scope or funding.

(3) Staff managing the project development shall keep the Customer Service Representative apprised of its status and of communication with customer agencies.

b. Primary audience: Customer agency management.

c. **Asbestos information presentation and question response:** The APM leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Planning staff.

d. **Presentation methods:** Usually the Customer Service Representative will write to customer agency heads, after being advised by the APM (if not the Customer Service Representative) and the manager of the development of the project. Visual aids may be used [see presentation methods, par. 5d(2)].

9. Project design.

a. Information topics:

(1) Customer agencies should be advised of planned phases of the design of this specific project. Customer agencies and the Customer Service Representative should be asked to inform the design manager of other current or planned projects, reorganizations, etc., which may affect the project. (The design manager should consult with managers of the design or construction of other projects at the building which may affect this project.)

(2) Customer agencies should be advised that the project team will be inspecting their space and conversing with their management and employees as required for project design. Such conversations should be coordinated with customer agencies' management so as not to interfere with their management/union/employee relations.

(3) Members and functions of the project design team can be identified to the customer agencies. For projects involving asbestos, the functions of GSA (including the Fee Developer, Portfolio Manager, S&EM staff, the Customer Service Representative and the APM) and contractors (including the A/E and GSA or A/E contractors, such as environmental or civil engineers, IH's, space planners, etc.) can be described.

(4) Contractors at the building should, as appropriate for the effect of the project on their work, be informed of the project design and involved in the project design survey.

(5) The possibility that unexpected presence or conditions of ACM may be encountered during the project should be noted [see building survey information, par. 5a(6)].

b. Primary audiences: Customer agency management and employees (in coordination with customer agency management), since members of the project team will be entering their space, and renovation of their space may be involved.

c. Asbestos information presentation and question response: The APM leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Portfolio Manager staff.

d. Presentation methods:

(1) Usually the Customer Service Representative will write to customer agency heads, after being advised by the APM (if not the Customer Service Representative) and the design manager. Meetings with customer agency heads, facility managers and/or employees may be held; if so, they are usually led by the Customer Service Representative and attended by the APM (if not the Customer Service Representative), who presents the asbestos findings, the design manager, and, optionally, S&EM staff or consultants and the Fee Developer. Visual aids may be used [see presentation methods, par. 5d(2)]. The design manager shall keep the Customer Service Representative apprised of its status and of communication with Customer agencies.

(2) For a major project involving asbestos work (such as an abatement or renovation project disturbing asbestos), a descriptive project brochure, provided from building management funds, should be developed, with copies printed for distribution to building occupants and the public.

10. Major project design evolution and revisions.

a. **Information topics:**

(1) Periodic communication of the project status should be made. The frequency (e.g., annual, semiannual, etc.) should reflect project and building conditions, and should be sufficient to ensure that customer agencies do not perceive, even if incorrectly, that they have been overlooked during the project design.

(2) Variations, if any, in the project design from its previous status. These should be described as soon as it is clear that they will occur, even if some details have not been resolved. Where these variations involve ACM, the customers should be reminded of the limitations of asbestos surveys [see building survey information, par. 5a(6)].

b. **Primary audiences:** Customer agency management and employees (in coordination with customer agency management), and contractors in the building, to the extent that project evolution or revisions affect their space or operations.

c. **Asbestos information presentation and question response:** The APM leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Portfolio Manager staff.

d. **Presentation methods:** Usually the Customer Service Representative will write to customer agency heads, after being advised by the APM (if not the Customer Service Representative) and the design manager. Visual aids may be used [see presentation methods, par. 5d(2)].

11. Construction.

a. Information topics:

(1) **Changes in scope.** During construction bidding, customers should be notified of any major changes in the scope of project design. Changes should be described as soon as contractually permissible when it is clear that they will occur, even if some details have not been resolved.

(2) **Preconstruction meeting.** Asbestos-related topics at a preconstruction meeting with customer agencies following contract award can include the construction contractor's overall plan of action and asbestos plan of action; the asbestos containment quality control program of the project construction manager, including visual and physical inspection and air monitoring to be performed on behalf of GSA; construction contractor's notification of regulatory agencies; means of disseminating asbestos information, including asbestos clearance results allowing reentry of customer spaces or initiating other events affecting customer agencies, and asbestos air monitoring results in and around the asbestos work areas; means of resolving potential project-related problems, such as from a release of asbestos outside the work area, inability to clear a space after asbestos work, generally aggravating conditions, project delays, or customer agency mission schedule requirements; project-related changes in the building's Occupant Emergency Plan, such as for developing a means of contacting customer agencies if a space can not be cleared for reoccupancy; changes in the contract or plan of action affecting customer agencies, who should be reminded of the limitations of asbestos surveys [see building survey information, par. 5a(6)].

(3) **Other projects.** Customer agencies and the Customer Service Representative should be asked to inform the manager of the construction of other current or planned projects, reorganizations, etc., which may affect the project. (The manager of the construction should consult with managers of the design or construction of other projects at the building which may affect this project.)

(4) **Disruption of routines.** The Customer Service Representative's office staff should be informed of the projected extent of disruption of building operating routines, so that they can appropriately serve customer agencies. Means for responding to asbestos-related and other customer agency or contractor complaints. In particular, the Customer Service Representative's office staff should be able to forward asbestos-related incident reports to the appropriate contact person (e.g., construction management contract representative, Customer Service Representative, planner/estimator).

(5) **Completion.** The completion of major phases of construction work, such as asbestos-related work, a renovation phase, and/or the whole project should be announced. Customer agencies should be thanked for their cooperation.

b. Primary audiences: Customer agency management and employees (in coordination with customer agency management), the Customer Service Representative's staff, and other contractors at the building.

c. Asbestos information presentation and question response: The APM leads these activities, supported by property management center and S&EM staff, the Fee Developer and Portfolio Manager staff.

d. Presentation methods:

(1) Usually the Customer Service Representative will write to customer agency heads, after being advised by the APM (if not the Customer Service Representative) and the manager of the construction. Meetings with customer agency heads, facility managers and/or employees may be held; if so, they are usually led by the Customer Service Representative and attended by the APM (if not the Customer Service Representative), who presents the asbestos findings, the manager of the construction, and, optionally, S&EM staff or consultants and the Fee Developer. Visual aids may be used [see presentation methods, par. 5d(2)].

(2) Periodic project update meetings should include asbestos work as a regular agenda item.

(3) Air monitoring results are frequently provided on bulletin boards and/or log books in lobbies or in hallways near the Customer Service Representative's or maintenance office. Asbestos clearance results for reentry of customer spaces are often posted on bulletin boards in lobbies or in hallways near the Customer Service Representative's or maintenance offices. Notice of the decision to allow reoccupancy is sometimes telephoned prior to reoccupancy to the head or safety officer of the customer agency occupying the affected space and/or the lead agency in the building.

(4) Should reoccupancy not be allowed at the expected time, telephone notification should be made in advance of the expected time, whenever feasible, to the head or safety officer of the agency occupying the affected space and the lead agency in the building, using previously obtained telephone lists.

12. Abbreviations used.

ACM	Asbestos-containing materials
A/E	Architectural/engineering firm
APM	Asbestos Program Manager
BER	Building Evaluation Report
GSA	General Services Administration
IH	Industrial hygiene firm
PBS	Public Buildings Service
PDS	Prospectus Development Study
PPRB	Planning and Project Review Board
PM	Property Management Division
S&EM	Safety and Environmental Management staff

Technical Guide

HAZARDOUS WASTE

BACKGROUND

In accordance with the Resource Conservation and Recovery Act (RCRA), the Environmental Protection Agency (EPA) issued regulations to carry out the national hazardous waste management program. The Act establishes the mandatory procedures and requirements for facilities that accumulate, transport, treat, store, or dispose of hazardous waste. The federal regulations for hazardous wastes are in Title 40 of the Code of Federal Regulations (40 CFR).

The General Services Administration (GSA) effectively manages government-owned facilities that accumulate, transport, treat, store, or dispose of hazardous waste. GSA will also clean up and control releases from GSA-managed spaces, when necessary. However, GSA is not responsible for managing hazardous wastes that client agencies accumulate, transport, treat, store or dispose of.

DISCUSSION

The hazardous waste management program applies to GSA owned, leased, and delegated facilities. Flowcharts in 40 CFR 260, Appendix 1, help to determine whether a material is a solid waste or RCRA hazardous waste. In addition, definitions of solid and hazardous waste are found in 40 CFR 261. However, hazardous waste defined by each state may be more stringent than those found in 40 CFR 261 and should be reviewed. Figure 1 provides an overview of the program logic.

REQUIREMENTS AND RECOMMENDATIONS

Generators

GSA facilities that generate hazardous waste are subject to Federal, state and local regulations. Requirements for hazardous waste generators are found in 40 CFR 261.5 and 262. The environmental staff determines the type of hazardous waste generated at GSA-managed facilities. The amount of hazardous waste generated monthly and/or accumulation quantities will determine if the facility is a RCRA

hazardous waste generator, a small-quantity generator, or a conditionally exempt small-quantity generator. Exclusions from hazardous waste requirements are in 40 CFR 261.4.

Transporters

GSA facilities that transport hazardous waste off-site must follow the requirements established by the EPA (40 CFR 263) and the Department of Transportation (49 CFR 171-180). These facilities are subject to an audit of records and transport operations by local, state, and Federal government authorities. GSA facilities are also responsible for the cleanup of any discharge that occurs during the transportation of hazardous waste.

GSA facilities will not:

1. Transport hazardous waste generated by other agencies.
2. Export or import hazardous waste.
3. Transport hazardous waste by rail or water.

Treatment, Storage and Disposal Facilities

GSA facilities that treat, store and dispose of hazardous waste are subject to a permitting system to ensure safe operation and protection of the environment. General standards for permitted facilities are found under 40 CFR 264/265. These facilities must develop and follow a Waste Analysis Plan, conduct inspections, training, and maintain an operating record.

Identification Numbers

Identification numbers identify facilities as generators of hazardous waste. Facilities must get an identification number from their state, if applicable, or from EPA. To obtain an identification number submit EPA Form 8700-12, or an appropriate state form to the EPA regional Administrator or state official, respectively. Transporters and treatment, storage and disposal facilities must also have identification numbers. (40 CFR 262, 263, 264, 265).

If a facility within GSA-controlled space is other than GSA and refuses to get an EPA identification number, the GSA facility manager must immediately inform the regional environmental staff. The facility must apply to its state or EPA for an identification number by submitting the appropriate form.

The amount of hazardous waste generated per month determines which facilities are required to obtain an identification number. Facilities generating 100 kilograms (kg) per month or more of hazardous waste must have an identification number. Facilities generating 1 kg per month or more of acute hazardous waste must also have an

identification number. The above quantities include small quantity generators and large quantity generators. Conditionally exempt small quantity generators are not regulated by 40 CFR Subchapter I - Solid Wastes.

Manifest

The manifest is a tracking device used to trace shipments of hazardous waste, and serves three purposes. The manifest identifies who generated and transported hazardous waste. It identifies who treated, stored and disposed of the waste. The manifest provides information during transport emergencies, and is used as a basis for recordkeeping and reporting.

The Federal regulations require a manifest to accompany hazardous waste transported offsite. GSA requires that signed copies of the manifests be on file indefinitely or retired to a records center for permanent retention with a microfiche copy kept at the facility or regional office. If the signed manifest is not received within the appropriate time, the GSA property management center must prepare a manifest exception report. The manifest requirements are in 40 CFR 262, 263, 264.

Contingency Plans/Emergency Procedures

Title 40 of the Code of Federal Regulations Part 264, Subpart D, or 40 CFR 265, Subpart D, outline the requirements established by EPA for contingency planning and emergency procedures. The designated facility environmental coordinator (i.e., supervisor in charge of the hazardous waste operation or the customer service representative or designee) for each GSA hazardous waste facility must develop and follow the applicable requirements.

Client Agencies

The management of a hazardous waste operations) is the responsibility of client agencies in GSA-controlled space. Whenever a client agency has a hazardous waste operation, the GSA facility manager must notify the environmental management staff so the facility may be included in the Safety and Environmental Management survey program to identify the hazardous waste. When a client agency responsible for treatment, storage and disposal operations ceases an operation and/or vacates the premises, the client agency must properly close the operation. The closure procedures must be according to the EPA regulations outlined in 40 CFR 264 or 265 and any applicable state and local regulations.

Recycling

The requirements established by EPA for recycled materials are in 40 CFR 266. The regional environmental management staff must review these requirements to determine applicability to regional operations, and must notify the recycling coordinator or appropriate point of contact.

Reporting

GSA hazardous waste generators that ship hazardous waste offsite to a treatment, storage and disposal facility must prepare a biennial report on EPA Form 8700-13A. The treatment, storage and disposal facility owner or operator must prepare a biennial report on EPA Form 8700-13B. Facilities must submit the reports to the appropriate EPA Regional Administrator by March 1 of each even numbered year. Facilities located in states with EPA-approved programs are subject to the state reporting requirements.

If an incident occurs requiring implementation of the contingency plan or emergency procedures, prepare a written report of the incident. Then within 15 days of discovery, submit the report to the EPA Regional Administrator (and appropriate state authority). Refer to 40 CFR 264.56 for specific requirements.

Recordkeeping

GSA requires property management centers to keep the manifest (EPA Forms 8700-22 and 8700-22a) copy signed by the generator, transporter, and treatment, storage and disposal facility indefinitely. After 3 years, the manifest copy can be filed at a records center with a microfiche copy kept at the facility or regional office. EPA requires facilities to keep the manifest for only 3 years from the date of acceptance by the initial transporter. If the appropriate office does not receive the hazardous waste manifest signed by the treatment, storage and disposal facility within the required period, follow the guidelines under 40 CFR 262.42.

GSA property management centers must keep a written copy of their contingency plans and emergency procedures.

GSA treatment, storage and disposal facilities must maintain a written copy operating record of the hazardous waste operations.

REFERENCES

Environmental Protection Agency: 40 CFR Parts 260-272, Subchapter I - Solid Wastes; Technical Requirements and State Program Approval.

Environmental Resource Center: Handbook for the Management of Hazardous Waste, 1992.

Department of Transportation: 40 CFR Parts 171-180, Hazardous Materials Regulations.

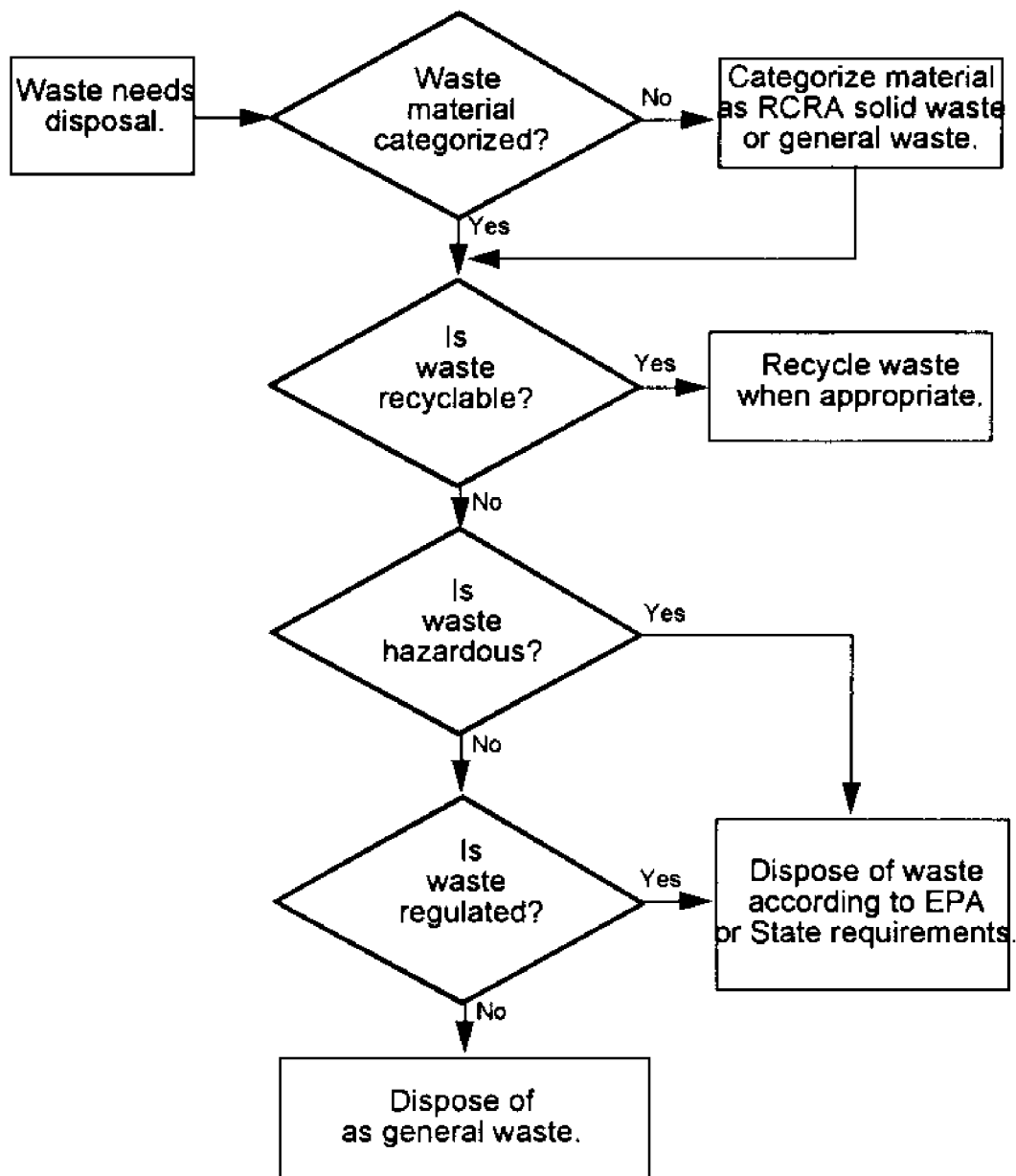


Figure 1
Resource Conservation and
Recovery Act (RCRA)

Technical Guide

UNDERGROUND STORAGE TANKS

BACKGROUND

The Environmental Protection Agency (EPA) finalized regulations impacting underground storage tanks (UST) in the Federal Register (53 FR 37082), on September 23, 1988, and codified in 40 CFR Parts 280 and 281. These regulations apply to all tanks containing petroleum products and hazardous substances as defined by the EPA. The regulations direct facilities to implement technical standards and corrective actions for the management of and releases from underground storage tanks. Further, the legislation specifically charges Federal agencies to follow not only the Federal requirements, but also applicable state and local regulations.

The General Services Administration (GSA) effectively manages GSA-owned/operated underground storage tanks, remedy leaking tanks promptly and in an appropriate manner, and follow Federal, and applicable state and local regulations in a manner that is cost effective to the agency.

DISCUSSION

The GSA underground storage tank program applies to all tanks owned and operated by the Public Buildings Service (PBS). The management program includes GSA-owned and delegated buildings, and leased space. Tanks owned and/or operated by other GSA services, (the Federal Supply Service or the Federal Property Resources Service), should manage them according to these guidelines, and are the responsibility of that Service. Figure 1 outlines the program management logic. This guidance does not apply to tanks owned or operated by other agencies or lessors. They are responsible for managing their own underground storage tank programs. This program does not apply to GSA tanks located above the floor in basements or cellars.

In addition to following the EPA requirements, the GSA underground storage tank program shall follow the Occupational Safety and Health Administration standards of 29 CFR 1910, 1926 and 1960.

REQUIREMENTS AND RECOMMENDATIONS

Tank Inventory

The Property Management Centers (PMC) shall identify all underground storage tanks, and complete an inventory (Fig. 2) of GSA-owned/operated tanks. The inventory shall include all tanks that are currently regulated by Federal, and applicable state and local regulations. The inventory shall also include tanks used for storing heating oil for consumptive use on premises where stored and emergency power generator tanks. Each PMC/field office with completed tank inventories shall keep a copy and send one to the regional environmental staff.

Ownership

The underground storage tank customer service representative (CSR)/field office manager and the Portfolio Manager (Real Estate Division) shall determine the ownership of each tank. If necessary, the regional environmental staff and the Office of General Counsel will provide assistance.

Leak Testing and Tank Upgrading

Underground Storage Tanks installed before December 1988 according to federal regulations, must be leak tested in phases by December 22, 1993. EPA also requires existing tanks to have corrosion protection and spill/overfill preventive devices by 1998. However, GSA requires EPA regulated tanks (and piping) 15 years old or older by 1994 to be replaced or upgraded. Figure 3 shows tank upgrading requirements. All EPA regulated tanks installed in 1974 or before, or of unknown age, should have been leak tested, closed or removed. All heating oil tanks should have also been leak tested, closed or removed.

Tank Retention

The UST customer service representative/field office manager determines the retention of a GSA-owned/operated tank based upon the decision logic in fig. 4 . Figure 5 outlines the retention logic for tanks in leased facilities. If a tank is retained, the determination must be made at least 6 months before a tank upgrade is required.

If the Government keeps a tank, conduct a site assessment in the area of the tank system. The site assessment will determine if there is leakage from the tank system into the environment. If leakage has occurred, cleanup the contaminated area and include the costs in the tank replacement/upgrade. Refer to 40 CFR Parts 280 and 281 and applicable state and local requirements for additional guidelines.

Tank Leak

If a tank leak occurs in a GSA-owned or delegated building or from a tank owned or operated by GSA in leased space, notify the UST customer service representative/field office manager. The UST customer service representative/field office manager should immediately notify the regional environmental staff. The regional environmental staff will advise the operator on how to proceed.

Tank Closure

The UST customer service representative/field office manager determines if a GSA-owned/operated tank will close. Before tank closure, conduct a tank assessment according to Federal, applicable state and local requirements. After closure of tanks, do not reuse materials for any purpose. Temporary closures are not permitted. Closures shall follow the guidance of 40 CFR Parts 280 and 281, the National Fire Protection Association (NFPA) and the American Petroleum Institute (API).

Management Plan

In each property management center/field office where there is a GSA-owned/operated underground tank, the customer service representative/field office manager shall develop a management plan for the tanks under his/her jurisdiction. This plan will identify applicable Federal, state and local requirements, specify the action planned for the tanks, and provide for a compliance schedule. The plan must contain the following as a minimum:

1. A listing of all tanks located at GSA-owned, leased, and delegated buildings.
2. An up-to-date inventory of all GSA-owned/operated tanks.
3. Records of tank notifications to implementing state agencies.
4. A priority ranking system for tank closure, replacement, and upgrade. Give attention first to those tanks that are known to be leaking. Second, consider tanks which are not leaking but are in noncompliance with applicable local, state, and Federal regulations.
5. Plan to mitigate releases from underground storage tanks.
6. A determination of estimated funds for tank projects and a schedule for implementation.
7. A plan for ongoing leak detection tests and repairs.

8. Reporting procedures for notification of releases from tanks.
9. Records management system and internal reporting of data to the regional office.

Tank Installation

All new tank installations shall meet applicable local, state, and Federal requirements. This includes, but does not limit installation to, insuring that the regional Fee Developer (D&C Division) provides specific construction project specifications. The specification will insure that tank and piping construction are of non-corrosive materials or are cathodically protected against corrosion. The specification shall also include leak detection and spill/overfill prevention.

Other GSA Services

The Federal Supply Service is responsible for all costs incurred during tank closure, removal, replacement or upgrade and for assessments, maintenance, permit fees and testing.

Delegated Space

In delegated space, the client agency is responsible for appointing an underground storage tank manager. The manager's duties include the day-to-day management of tanks including periodic testing, spill cleanup, and site assessments. GSA will determine the disposition (e.g., closure, replacement, and upgrade) of the tanks.

Client Agencies Space

GSA client agencies in leased space that operate tanks must follow all applicable local, state, and Federal requirements. For non-GSA owned/operated tanks, GSA will provide technical assistance to client agencies on a reimbursable work authorization basis.

Reporting/Recordkeeping

Provide an up-to-date copy of the annual UST inventory report to the Central Office environmental team by December 31 of each year. Ensure the specific type of tank (i.e., heating oil tank, emergency power generator tank, EPA regulated tank) is included on the underground storage tank inventory report.

Provide an underground storage tank summary report to the Central Office environmental team by March 31 of each year.

Track information about underground storage tank upgrade, replacement, and closure due to leaks in the Safety and Environmental Management System (SAFE) and the Repair and Alterations Computerized Automated Tracking System (RACATS). In addition, ensure information concerning the extent of contamination, corrective action, and estimated costs associated with cleanup are noted in SAFE entries under condition description, recommended actions or comments.

Keep all records related to tank activities at the office of the operator (e.g., GSA property management center). Send copies of the records to the regional environmental staff. Delegated agencies will keep such records for inspection. These records include leak detection tests, closures, or tanks transferred to an owner or operator other than GSA. Keep all records at the site for 5 years. After which, transfer the records to a records center and retain for 20 years. EPA requires facilities to keep release detection records for 5 years after the date of installation and tank closure records 3 years after completion of permanent closure.

REFERENCES

Environmental Protection Agency: 40 CFR Parts 280-281, Underground Storage Tanks; Technical Requirements and State Program Approval; Final Rules, September 23, 1988.

Environmental Protection Agency: "Leak Lookout," EPA 530/UST-88/006 August 1988.

Environmental Protection Agency: "EPA Evaluation of Volumetric Leak Detection Methods for Underground Fuel Storage Tanks," 2 volumes, EPA 600/2-88/068a, EPA 600/2-88/068b, available through National Technical Information Service (NTIS).

Environmental Protection Agency: "Must for USTS," EPA/530/UST-88/008, July 1990.

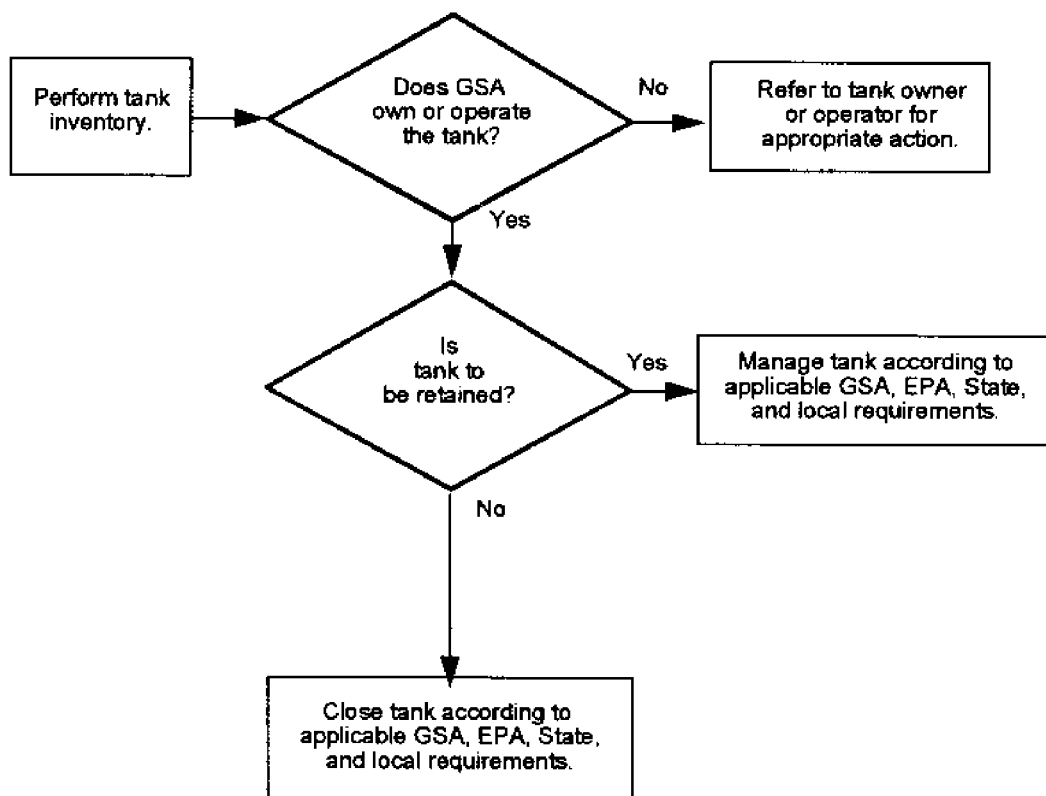


Figure 1
Underground Storage Tank
Management Program

[illegible]

Figure 2

TYPE OF TANK & PIPING	LEAK DETECTION	CORROSION PROTECTION	SPILL/OVERFILL PREVENTION
New Tanks and Piping*	At installation	At installation	At installation
Existing Tanks** Installed: Before 1965 or unknown 1965-1969 1970-1974 1975-1979 1980-December 1988	By No later Than December 1989 December 1990 December 1991 December 1992 December 1993	} December 1994	} December 1994
Existing Piping** Pressurized Suction	December 1990 Same as existing tanks	December 1994 December 1994	Does not apply Does not apply
*New tanks and piping are those installed after December 1988 **Existing tanks and piping are those installed before December 1988			

IF YOU CHOOSE TANK TIGHTNESS TESTING AT EXISTING USTs...

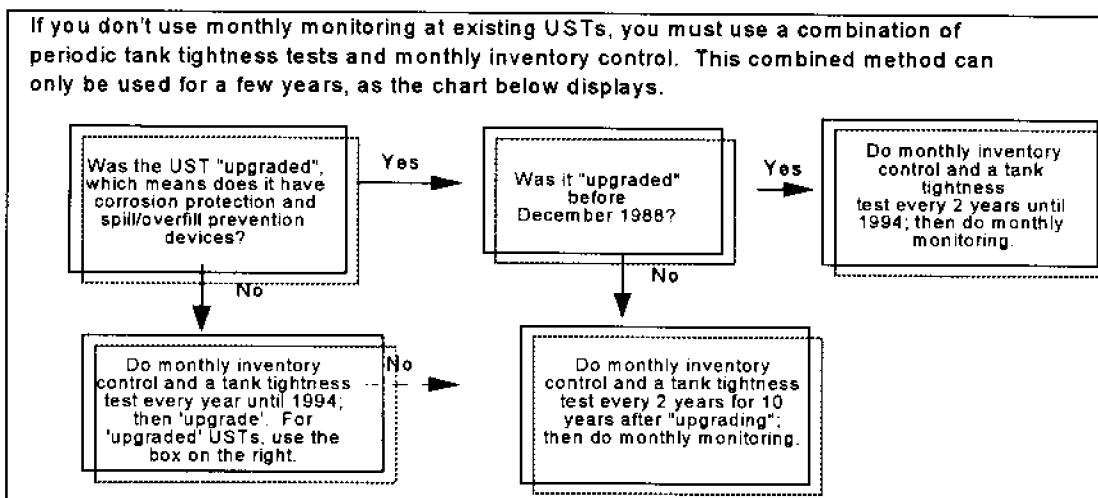


Figure 3

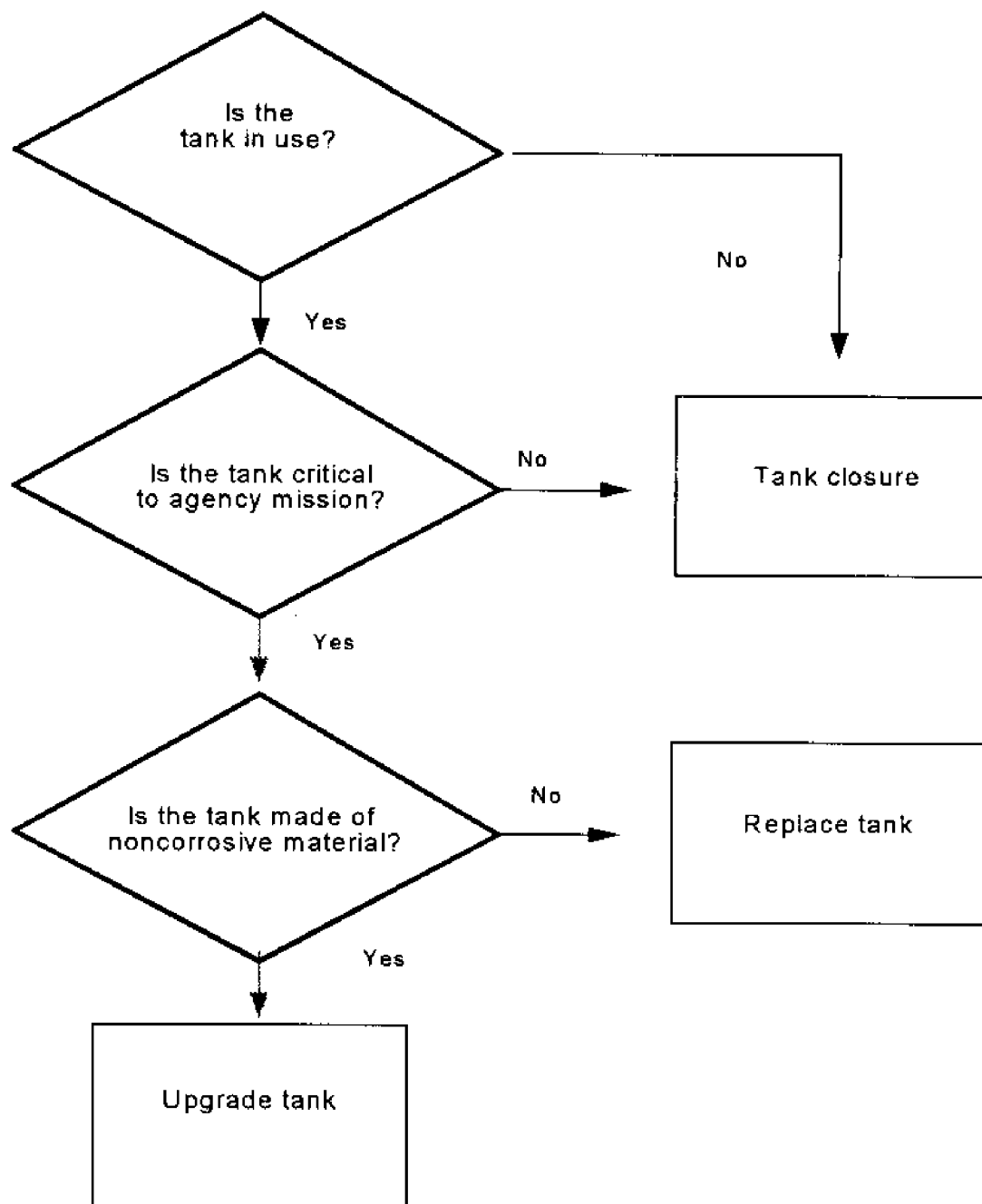


Figure 4
Retention Logic for GSA Owned or
Operated Tanks

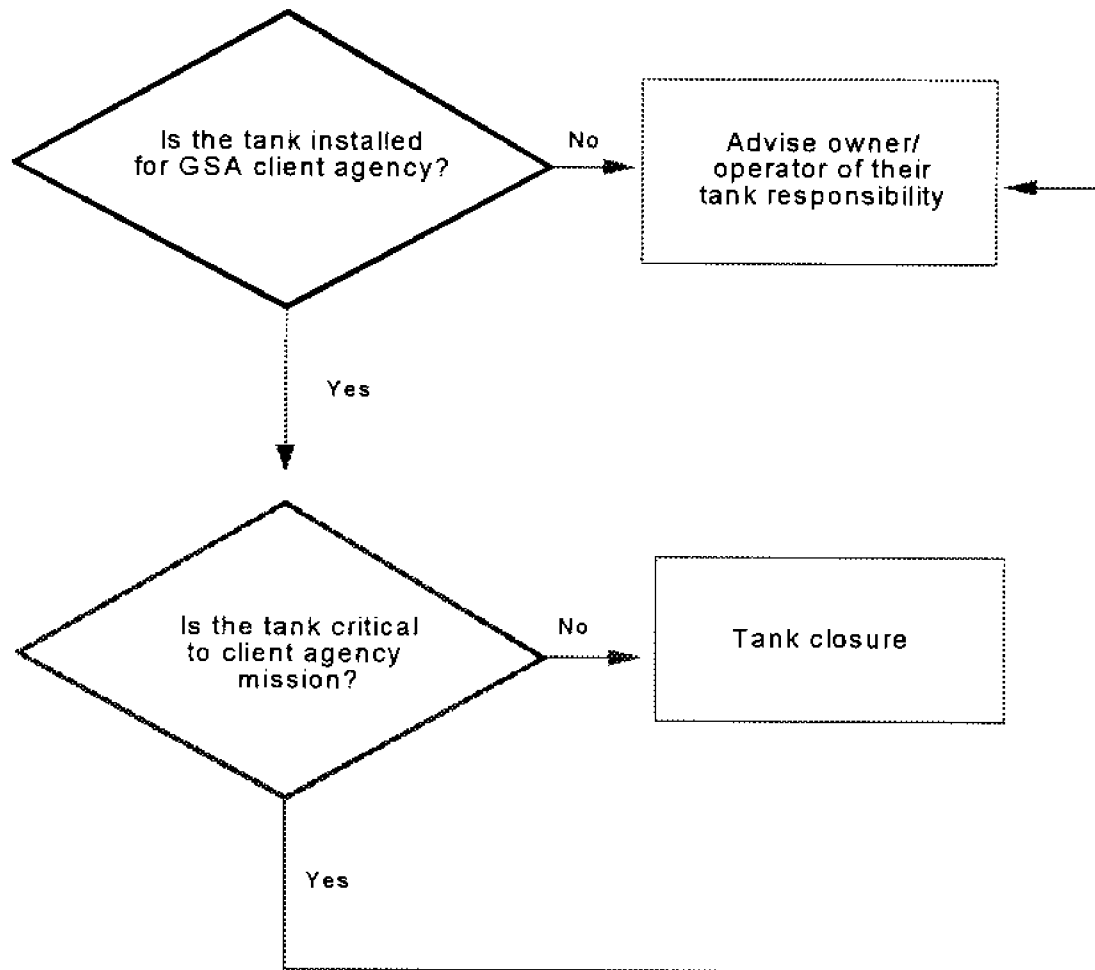


Figure 5
Retention logic for tanks in GSA leased facilities

Technical Guide

SUPERFUND REQUIREMENTS

BACKGROUND

The Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA or Superfund) was enacted in 1980. The Act passed during the concern over the public health threat posed by the Love Canal site in Niagara Falls, New York. The Act directs attention to the lack of legislation focused on cleanup of abandoned hazardous waste disposal facilities. In 1986, the enactment of the Superfund Amendments and Reauthorization Act expanded CERCLA. CERCLA does not create a regulatory program, but provides authority and distributes responsibility for cleanup of contaminated soil, surface water and groundwater.

The General Services Administration (GSA) controls and cleans up hazardous substances from GSA-managed facilities released into the environment.

DISCUSSION

The Superfund requirements under 40 CFR apply to GSA owned, leased and delegated buildings. The regulations outline requirements for the assessment and control of pollutants from inactive hazardous substance disposal sites. This section also applies to releases of hazardous substances into the environment that facility permits do not cover. Figure_1_outlines the program logic.

REQUIREMENTS

GSA Releases

If GSA is responsible for a release of a hazardous substance:

1. The person who discovers the release must immediately notify the customer service representative/field office manager.
2. The field office manager must notify the regional environmental staff who will advise the Central Office of the release.

3. The regional environmental staff must insure implementation of remedial actions and/or removal operations agreed upon with the state and local authorities or established by EPA.

If GSA releases a hazardous substance of reportable quantity:

1. The person who discovers the release must immediately notify the customer service representative/field office manager.
2. The customer service representative/field office manager must immediately notify the National Response Center (NRC).
3. The customer service representative/field office manager must also notify the regional environmental staff who will advise the Central Office environmental team of the release.
4. The GSA regional environmental staff or appropriate business line (division) (e.g., Fee Developer (Design and Construction)) must conduct a preliminary assessment and site inspection (PA/Si), and forward a copy to the proper regional EPA office. Refer to 40 CFR 300.420 for more details about the PA/Si process.
5. The regional environmental staff must insure proper procedures are initiated to control and cleanup the release. This includes coordination with other **GSA** regional offices (e.g., Fee Developer (Design & Construction), Repair & Alterations, Buildings Management, Contracts, etc.). Working with various regional offices will insure remedial actions and/or removal operations are conducted according to the state and local authorities or the EPA.

Client Agency Releases

Client agencies responsible for a release from GSA-controlled spaces must initiate proper procedures to control and cleanup the release. If the release is of reportable quantity:

1. Immediately notify the customer service representative/field office manager.
2. The customer service representative/field office manager must notify the regional environmental staff who will advise the Central Office of the release.

3. The responsible client agency must initiate or arrange for the removal of, and provide for remedial action relative to the released hazardous substance, pollutant, or contaminate (including removal from any contaminated natural resource). The client agency must take any other response measure consistent with the National Contingency Plan under 40 CFR 300.
4. The GSA regional environmental staff or appropriate business line (division) (e.g., Fee Developer (Design and Construction)) must conduct a PA/Si (40 CFR 300), and forward a copy to the appropriate regional EPA office.
5. Contact the Office of General Council concerning any legal issues.

Previous Occupant Releases

If a past release caused by a Federal agency or a non-Federal party that occupied the space before GSA's ownership or occupancy, the GSA regional environmental staff must:

1. Advise the Central Office environmental team (S&EM Division) and, if necessary, the appropriate EPA regional office of the findings.
2. Notify the responsible party/agency by telephone and with a followup letter of the findings. Request the responsible party/agency to place the site on its hazardous waste site inventory, as required by EPA; take appropriate steps to assess the contamination of the site; and implement any necessary remedial action and cleanup.
3. Contact the Office of General Council concerning any legal issues.

Potential Responsible Party

If GSA receives a notification from Federal or State authorities or their representatives about involvement as a potentially responsible party (PRP) on a hazardous waste site under investigation:

1. The customer service representative /field office manager must advise the appropriate GSA regional environmental staff after receiving the PRP notification.
2. The regional environmental staff must investigate the inquiry and inform Central Office environmental team. After completing the investigation and discussing the findings with Central Office environmental team, forward the appropriate response to the corresponding EPA region.

3. Contact the Office of General Council concerning any legal issues.

Reporting

If a release of a hazardous substance extends to the environment and equals or exceeds the reportable quantity, the GSA regional environmental staff must notify the following officials:

1. The National Response Center (NRC)
2. The EPA Regional Administrator, and
3. State or local authorities

The regional environmental staff must submit a hazardous waste site biennial inventory each odd-numbered year. By November 1 of each odd-numbered year, submit the inventory to the Central Office environmental team. Report the inventory on the EPA Inventory of Federal Hazardous Waste Activities available from the regional EPA Office of Solid Waste.

REFERENCES

Environmental Protection Agency: 40 CFR Parts 300-302, Subchapter J - Superfund, Emergency Planning, and Community Right-to-Know Programs.

Executive Enterprises, Inc.: Environmental Regulation Course, Section 1 1, July 1991.

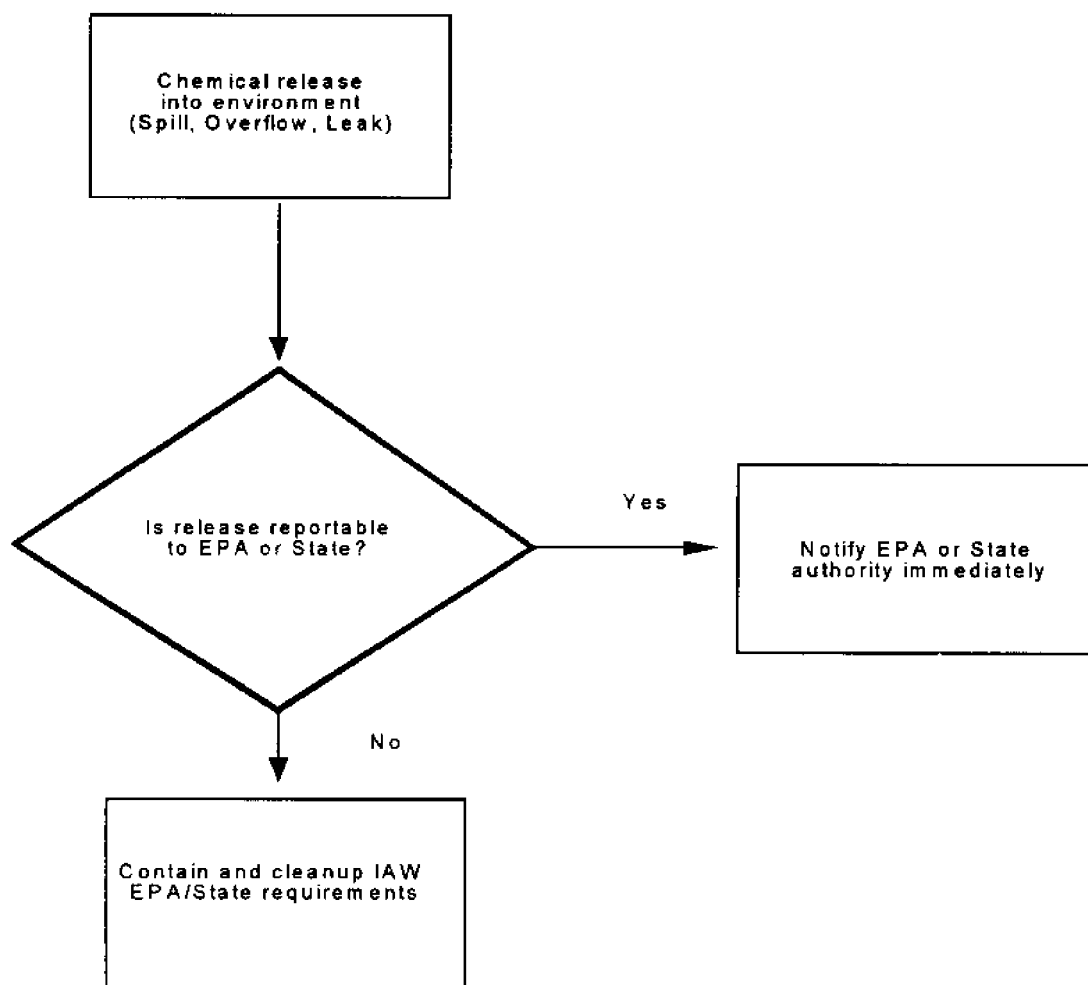


Figure 1
CERCLA Notification

Technical Guide

SARA TITLE III: EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW GUIDANCE

BACKGROUND

Title III of the Superfund Amendment and Reauthorization Act of 1986 establishes requirements for Federal, state and local governments and industry regarding emergency planning and community right-to-know reporting on hazardous and toxic chemicals. Title III builds upon the Environmental Protection Agency's (EPA) Chemical Emergency Preparedness Program and many state and local programs aimed at helping communities to better prepare for potential chemical emergencies.

The Act required the Governor of each state to establish a State Emergency Response Commission. Each state commission designates local emergency planning districts and appoints Local Emergency Planning Committees for each district. The local committee is responsible for developing an emergency response plan, reviewing the plan once a year and implementing the plan, when necessary.

Executive Order 12856 requires all Federal agencies within the US customs territory to follow the planning and reporting provisions of the Act, as well as, the Pollution Prevention Act of 1990. Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements, was signed by the President on August 3, 1993. The goal of the Order is to have the Federal Government become a leader in the field of pollution prevention by eliminating or reducing pollutants.

The main objectives of the Executive Order are to have federal agencies:

- Comply with the emergency planning and reporting requirements of the Act;
- Report releases and transfers off-site of toxic chemicals (40 CFR 372.65) equal to or exceeding the reportable quantities (regardless of the standard industrial classification codes);
- Develop an agency-wide pollution prevention strategy;
- Develop goals to reduce the total releases and off-site transfers of **toxic chemicals** in half (50%) by 1999 ;
- Establish a plan and goals for eliminating or reducing unnecessary acquisition of products with extremely hazardous substances and/or toxic chemicals;
- Develop pollution prevention plans for each facility by 1995;

- Make changes to specifications by 1995; and,
- Make strategies, plans, and reports accessible to the public.

Following the emergency planning and community right-to-know requirements allows GSA to help increase the public's knowledge and access to information on the presence of hazardous chemicals, extremely hazardous substances, or toxic chemicals in their communities and releases of these chemicals into the environment.

DISCUSSION

The emergency planning and community right-to-know guidance applies to all GSA owned, leased, and delegated facilities with hazardous or extremely hazardous substances, constituents, or chemicals of reportable quantity on their premises or toxic chemicals released at the facility or transferred off-site for disposal. All GSA Services (i.e., FSS, PBS, etc.) must follow the Act and implement and manage their activities according to this guidance.

Client agencies subject to the requirements must also manage their programs according to the Act. Other agencies not occupying GSA-controlled space or lessors subject to the Act must administer their own programs according to Federal, and applicable state and local regulations.

REQUIREMENTS AND RECOMMENDATIONS

GSA-Controlled Space

Facilities storing or otherwise using hazardous chemicals (40 CFR 302.4) or extremely hazardous substances (40 CFR 355) must administer their right-to-know activities as a part of their facilities management programs. Each region must determine whether the facilities are subject to the Act's requirements (see Figure 1). Therefore, facilities (property management center/field office, supply center, etc.) in GSA-controlled space must:

1. Inventory hazardous chemicals and extremely hazardous substances and determine if they meet or exceed the threshold planning quantity.
2. Designate a facility emergency coordinator (e.g., customer service representative/buildings manager, environmental coordinator, etc.). The facility emergency coordinator serves on the local committee, participates in the planning process, and implements the emergency plan, when necessary.
3. Provide information necessary to develop and/or implement the emergency response plan to the local committee, upon request.
4. Notify the appropriate state and local emergency response officials of facilities with hazardous chemicals or extremely hazardous substances that equal or

exceed the threshold planning quantities. The threshold planning quantities for hazardous chemicals and extremely hazardous substances range from 1 pound to 10,000 pounds.

5. Integrate the emergency planning and community right-to-know requirements into existing spill prevention/emergency response procedures.

Facilities manufacturing, processing, using, or disposing (off-site) of toxic chemicals equal to or exceeding the reportable quantities must submit an annual toxic release inventory to regional EPA and state officials. The reporting requirement informs the public and government officials about routine releases of toxic chemicals into the environment. Federal facilities with ten or more full-time employees must submit a toxic inventory regardless of the standard industrial classification codes. The list of toxic chemicals is found under 40 CFR 372.65.

Updating Plans

Each regional/local office subject to the Act must update, at least annually, existing spill prevention control and countermeasure plans, emergency response plans, and contingency plans. Each plan must include the emergency planning and community right-to-know requirements.

Executive Order 12856 requires covered facilities to develop a facility pollution prevention plan by December 31, 1995. The plan identifies facility-wide methods to reduce pollutant and reach the required reduction goals. Depending on the size of the facility the plan should include the following components:

- Set facility goals.
- Management commitment to pollution prevention.
- Baseline study.
- Identification of opportunities and options.
- Ranking of options.
- Implementation and evaluation.

These components will be explained in detailed under a new technical guide once EPA has completed its guidance, "Federal Facility Pollution Prevention Planning Guide."

Regional/local offices must also assure employees working with hazardous substances receive training that meets the requirements under 29 CFR 1910.120, Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response, before they are permitted to engage in emergency responses.

GSA Releases

If a hazardous chemical or extremely hazardous substance of reportable quantity is released at a GSA-controlled space. (The reportable quantities will vary for each chemical from 1 pound to 10,000 pounds). See 40 CFR 355, 40 CFR 302.4 and 29 CFR 1910 for the lists of chemicals and quantities.

1. Immediately notify the customer service representative/buildings manager or designated person who will contact the state commission, local committee, local fire department and the National Response Center. If a local committee is not established, notify the appropriate local response officials.
2. Immediately notify the facility emergency coordinator.
3. The notification made via telephone, radio or in person must include
 - The chemical name;
 - An indication of whether the substance is extremely hazardous;
 - An estimate of the quantity released into the environment;
 - The time and duration of the release;
 - The type of release that occurred (i.e., air, water, and/or land);
 - Any known or anticipated acute or chronic health risks associated with the release, and where necessary, advice regarding medical attention for exposed individuals;
 - Proper precautions, such as evacuation or sheltering in place; and,
 - Name and telephone number of the contact person.
4. After a verbal notification, a written follow-up is required as soon as practicable after the release. The notice must update information included in the initial notice; provide information on actual response actions taken; and advice regarding medical attention necessary for exposed individuals.
5. Contain and cleanup the spill according to GSA and regulatory requirements.
6. Notify the regional environmental staff which will advise the Central Office environmental team of the release.

If a release occurs that does not require Federal notification:

1. Notify, the customer service representative/buildings manager or designated person who will advise the regional environmental staff of the release.
2. Notify the facility emergency coordinator.
3. Contain and cleanup the release.

Client Agency Releases

Client agencies following the Act must notify the appropriate customer service representative/field office manager of their activities.

If a release occurs of reportable quantity from GSA-controlled space:

1. immediately notify the customer service representative/buildings manager or designated person, the state commission, local committee, local fire department and the National Response Center. If a local committee is not established, notify the appropriate local response officials.
2. The responsible client agency must contain and cleanup the spill according to regulatory requirements and follow other applicable requirements.
3. The customer service representative/field office manager must notify the regional environmental staff who will advise the Central Office environmental team of the release.

Reporting

The Act has the following specific notification and reporting requirements.

Hazardous Chemicals/Substances.

1. Facilities which have extremely hazardous substances equal to or exceeding threshold planning quantities must notify the state commission, the local committee and the EPA Regional Office (40 CFR 355 and 40 CFR 302)
2. Facilities which use or store extremely hazardous substances or hazardous chemicals must notify the state commission and the local committee likely to be affected if a release of a reportable quantity occurs (40 CFR 302 and 355).
3. Facilities required to prepare or have available Material Safety Data Sheets (MSDSs) under the OSHA regulations must report the following information to the local committee, state commission and the local fire department.
 - a. Copies of MSDSs or a list of extremely hazardous substances at or exceeding 500 pounds or the threshold planning quantity, whichever is lower; or 10,000 pounds for all other hazardous chemicals. If a list of chemicals is submitted, provide the MSDSs to the local committee, state commission or local fire department, upon request (40 CFR 370, subpart B). When new chemicals are present at a facility they must be submitted to local authorities
 - b. Tier I and/or Tier II hazardous chemical inventory form for extremely hazardous substances and hazardous chemicals. The threshold for extremely hazardous substances is at or exceeding 500 pounds or the threshold planning quantity, whichever is lower; and 10,000 pounds for all other hazardous chemicals. If the Tier I information is submitted, provide the Tier II form to the local committee, state commission or local fire department, upon request. The Tier I/II information must be submitted to an EPA regional office and designated state/local officials no later than March 1 of each year (40 CFR 370, subpart C). Data collection for the hazardous chemical inventory began January 1, 1994. The first GSA report is due March 1, 1995.

Toxic Chemicals.

4. Facilities that manufacture, process, use, or transfer (off-site) for disposal of a toxic chemical equal to or in excess of the reportable quantity, must

submit an inventory no later than July 1 of each year (40 CFR 372). See Figure 2. Data collection for federal agencies began January 1, 1994, and the first report is due July 1, 1995.

a. The reportable quantities are 25,000 pounds for facilities that manufacture or process toxic chemicals and 10,000 pounds for toxic chemical otherwise used or transferred off-site for disposal.

b. The covered facilities must submit the toxic chemical inventory form (Form R) or a state specific form to the EPA regional office or designated state officials.

c. Covered facilities that have do not release toxic chemicals during the calendar year are required to report. The reporting requirements are based on the number of employees and the quantity of a toxic chemical that was manufactured, processed, otherwise used, or transferred off-site during the calendar year.

EXEMPTIONS

The Act also has specific exemptions, please see technical guide E204a.0395 for a complete list.

REFERENCES

Environmental Protection Agency: 40 CFR Parts 302-372, Subchapter J - Superfund, Emergency Planning, and Community Right-to-Know Programs.

Environmental Protection Agency: "SARA Title III Fact Sheet, Emergency Planning and Community Right-to-Know," January 1993.

Executive Order 12856 of August 3, 1993, Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements. Federal Register Volume 58, Number 150, Friday, August 6, 1993.

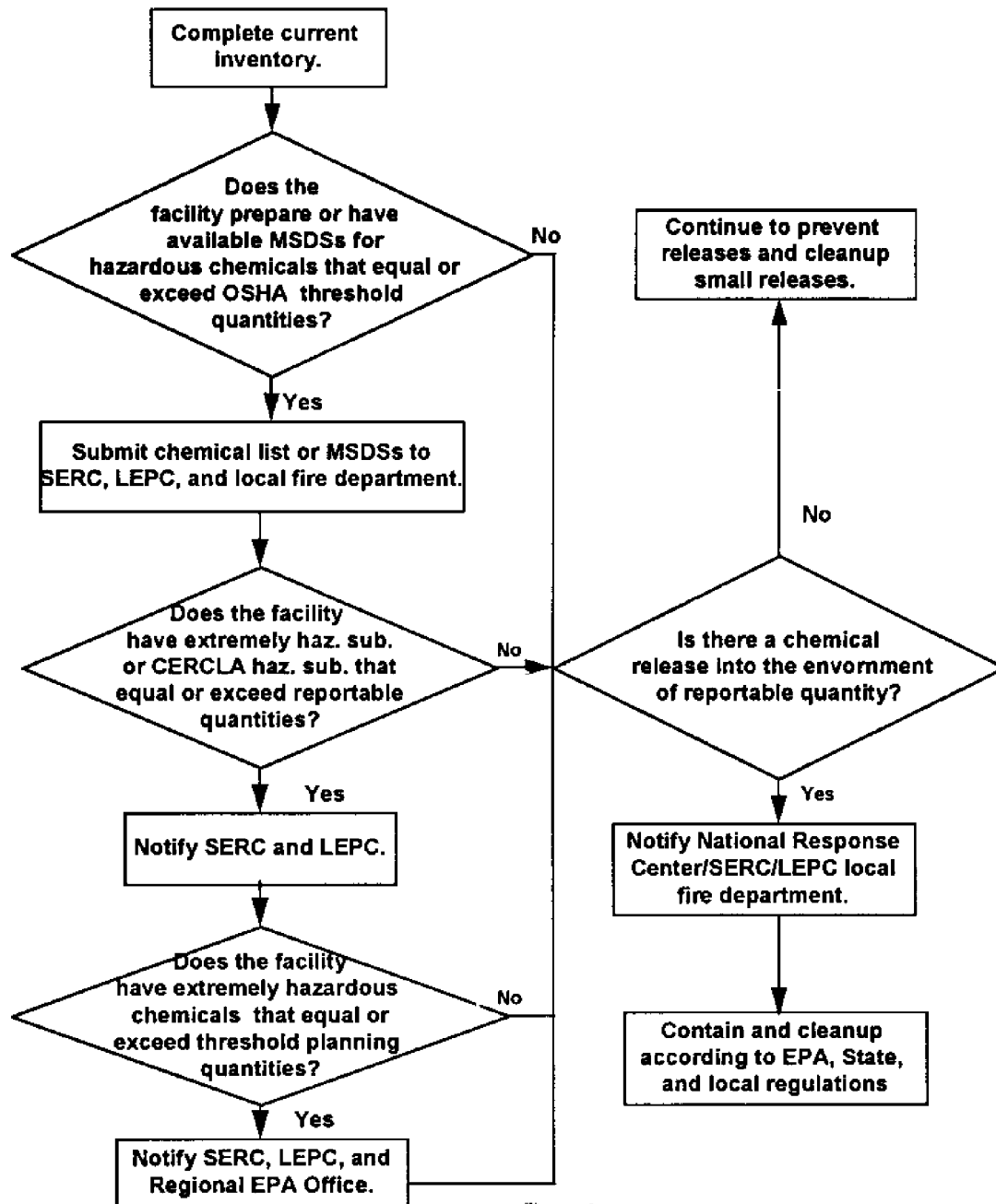


Figure 1
SARA Title III Emergency Planning
Community Right-to-Know

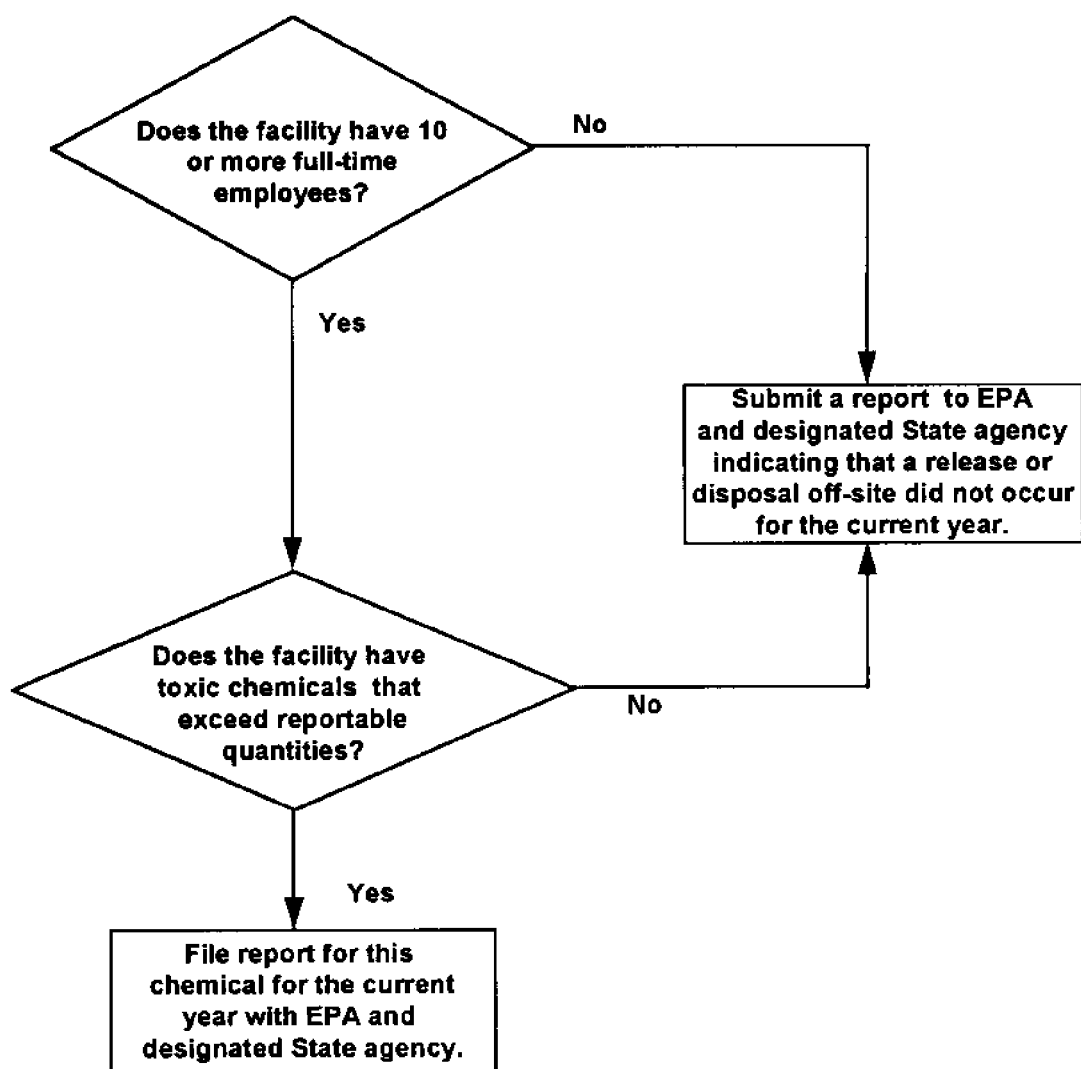


Figure 2
SARA Title III Emergency Planning
Community Right-to-Know.
Section 313 Toxic Release Reporting

Technical Guide

SARA TITLE III: EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW EXEMPTIONS

BACKGROUND

Title III of the Superfund Amendment and Reauthorization Act of 1986 establishes requirements for Federal, state and local governments and industry regarding emergency planning and community right-to-know reporting on hazardous and toxic chemicals. Title III builds upon the Environmental Protection Agency's (EPA) Chemical Emergency Preparedness Program and many state and local programs aimed at helping communities to better prepare for potential chemical emergencies.

On August 3, 1993, the President signed Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements. The Executive Order requires all federal agencies to comply with the planning and reporting provisions of the Act , as well as the Pollution Prevention Act of 1990.

EXEMPTIONS

The Act exempts certain uses of chemicals from the reporting requirements. The exemptions pertain to specific sections (Sections 302, 304, 311 and 312) of the Act and must be applied accordingly (i.e., a specific exemption may be applicable to only one section of the law and not to others). Further, exemptions are to be applied to specific uses of listed chemicals, and do not necessarily create an exemption for an entire facility and should therefore be considered for threshold purposes and reporting (i.e., a facility's use of a chemical for certain activities may be exempt, while other uses may not be exempt).

EPCRA Section 302 - Emergency Planning

The Act required the Governor of each state to establish a State Emergency Response Commission. Each state commission designates local emergency planning districts and appoints Local Emergency Planning Committees for each district. The local committee is responsible for developing an emergency response plan, reviewing the plan once a year and implementing the plan, when necessary.

There are no exemptions under this section. (40 CFR 355)

EPCRA Section 304 - Emergency Release Notification

The Act under Section 304 requires facilities that produce, use or store hazardous chemical(s) to report a release of an extremely hazardous substance or CERCLA hazardous substance of a reportable quantity to the proper authorities. (40 CFR 355)

The statute, however, provides the following exemptions from notifications:

- "Federally permitted releases" as defined under CERCLA section 101 (10)
- Releases which result in exposure to persons solely within the boundaries of the facility (EPCRA section 304 (a)(4)).
- "Continuous releases" stable in quantity and rate, provided other restrictions established as defined under CERCLA section 103(f) are met -- reporting would be required for initial release and statistically significant increases.
- Application of a pesticide registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) or the handling or storage of such pesticide by an agricultural producer (See CERCLA section 103(e)).
- Emissions from engine exhaust of a motor vehicle, rolling stock, aircraft, or pipeline pumping station engine (CERCLA section 101 (22)(B)).
- Normal application of fertilizer (CERCLA section 101 (22) (D)).
- Release of source, by product, or special nuclear material from a nuclear incident at a facility subject to financial protection requirements established by the Nuclear Regulatory Commission (i.e., nuclear power plants) (CERCLA section 101 (22) ©)
- Releases which result in exposure to persons solely within a workplace with response to a claim which such persons may assert against their employers;
- With respect to transportation, or storage incident to transportation, notice is satisfied by dialing 911, or calling their operator in the absence of an emergency telephone number.

EPCRA Section 311 and 312 - Community Right-to-Know Reporting Requirements

The Act requires facilities that prepare or have available a material safety data sheet for a hazardous chemical(s) under the Occupational Safety and Health Act of 1970 that is equal to or above the reportable quantities or the threshold planning quantities to report these quantities to the proper authorities.(40 CFR 370)

The following chemicals are not considered hazardous chemicals under sections 311 and 312:

- Any food, food additive, color additive, drug, or cosmetic regulated by the Food and Drug Administration.
- Any substance present as a solid in any manufactured item to the extent exposure to the substance does not occur under normal conditions of use.
- Any substance to the extent it is used for personal, family, or household purposes, or is present in the same form and concentration as a product packaged for distribution and use by the general public.
- Any substance to the extent it is used in a research laboratory or a hospital or other medical facility under the direct supervision of a technically qualified individual.
- Any substance to the extent it is used in routine agricultural operations or is a fertilizer held for sale by a retailer to the ultimate customer.

EPCRA Section 313 - Toxic Chemical Release Reporting

The Act requires facilities that manufacture, process, use, or transfer (off-site) for disposal of a toxic chemical equal to or in excess of the reportable quantity must submit an inventory.

Exemptions for toxic chemicals found under 40 CFR 372 normally include activities in Standard Industrial Classification codes 20-39 rather than federal facilities. However, the General Services Administration concurs with these exemptions, where applicable. These exemptions include the following areas:

- Intake Water/Air Use Exemption
- Laboratory Activities Exemption
- Motor Vehicle Maintenance Use Exemption
- Personal Use Exemption
- Routine Janitorial/Maintenance Use Exemption
- Structural Component Use Exemption

Intake Water/Air Use Exemption 40 CFR 372.38(c)(5)

Water. Exempts the use of toxic chemicals present in process water or noncontact cooling water, as drawn from the environment or from municipal sources. Air. Exempts listed chemicals present in air used either as compressed air or as part of combustion.

Laboratory Activities Exemptions 40 CFR 372.38(d)

Laboratories, at a covered facility, that use toxic chemicals are not required to report the quantity manufactured, processed, or used for quality control, research and development and other laboratory activities under a technically qualified person. See 40 CFR 720.3 (ee) and 40 CFR 372.25 for specific information.

However the exemption does not apply to the following cases:

- Specialty chemical production. Chemicals produced in a laboratory setting that are distributed in commerce or for use other than in laboratory activities at the facility or elsewhere.
- Manufacture, processing, or use of toxic chemicals in pilot plant scale operations. Due to the sufficient amount of listed chemicals that may be used during a pilot operation the burden of tracking and reporting is presumed to be reasonable.
- Activities conducted outside the laboratory.

Activities that do not directly support research and development, sampling and analysis, or quality assurance or control must be considered for EPCRA section 313 reporting.

Motor Vehicle Maintenance Use Exemptions 40 CFR 372.38(c)

Motor vehicle includes but is not limited to cars, trucks, planes, watercraft, missiles, spacecraft, military vehicles (e.g., tanks), and motorized vehicles such as cranes and forklifts.

The exemptions include: buildings manufacturing and/or repairing motor vehicles; ships docked in port at a Federal facility that are conducting shore-based maintenance or support activities; toxic chemicals used during operational maintenance activities (e.g., de-icing wings).

Note: Routine aircraft refueling operations count toward the toxic chemical inventory.

Personal Use Exemption 40 CFR 372.38(c)(3)

Exempts toxic chemicals used by employees or other persons at a facility. Examples include: facility-operated cafeteria, commissary, exchange, infirmary, or in activities associated with morale, welfare and recreation. Types of products: foods, drugs, cosmetics, office supplies, or other personal items.

Routine Janitorial/Facility Grounds Maintenance 40 CFR 372.39(c)(2)

Routine maintenance exemption includes activities using substances such as bathroom cleaners, fertilizers and pesticides used to maintain facility lawns. Listed chemicals used for routine janitorial and facility grounds maintenance. However, if aerial applications of pesticides are applied to grounds as a part of its primary mission then it will be reportable.

Examples include: Cleaning supplies, fertilizers, and pesticides similar in form or concentration to consumer products.

Structural Component Use Exemptions 40 CFR 372.38(c)(1)

Components used to ensure or improve the structural integrity of a facility.

Examples include: copper in copper pipes used for the plumbing in the facility; listed chemicals contained in paint which are used to improve the appearance or prevent the deterioration of the facility structure; painting of large external features such as cranes at shipyards.

Other Section 313 exemptions

Warehouses that only store toxic chemicals are not required to report under Section 313. However, if warehouse representatives repackage toxic chemicals (e.g., pouring from a 55 gallon to a smaller container) that is considered processing and should be counted toward threshold determination for the chemicals).

GENERAL EXEMPTIONS

Landlords (i.e., GSA) that lease property to others and receive no service or benefit besides rent then the landlord is not responsible for reporting under EPCRA for that agency.

GSA is not responsible for reporting for agencies located in a building managed, [leased or owned by GSA.

For states with fee programs, federal facilities are not required to pay EPCRA report filing fees. These fees are considered a tax because there is no service provided by the state to the Federal government.

REFERENCES

Interim Final Draft Guidance for Implementing Executive Order 12356, Federal Compliance with Right-to-Know and Pollution Prevention Requirements, February 28, 1994.

Environmental Protection Agency: 40 CFR Parts 302-372, Subchapter J Superfund, Emergency Planning, and Community Right-to-Know Programs.

Technical Guide

FEDERAL AGENCY HAZARDOUS WASTE COMPLIANCE DOCKET

BACKGROUND

The Federal Agency Hazardous Waste Compliance Docket was established under the authority of Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C 9620(c) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The purpose of the docket is to identify Federal facilities that must be evaluated to determine if they pose a risk to public health and the environment; to compile and maintain the information submitted to the Environmental Protection Agency (EPA) on these facilities; and to provide a mechanism to make this information available to the public.

Central Office environmental team receive an update of the Federal docket every 6 months or when published. This information is forwarded to each region for review. If a site is listed on the Federal docket, GSA must perform a preliminary assessment (PA) within one year.

DISCUSSION

Definition of Facility for Docket Purpose

EPA defines a "Federal facility" as all contiguous land that is owned by a department, agency, or instrumentality of the United States. This includes all individual sites or units on the owner's property, including Government-owned, contractor-operated sites.

EPA has recently decided to include on the docket any privately owned, Government-operated (POGO) facilities that meet any of the four provisions listed above. A POGO is a facility where the government leases buildings or space for its operations.

If GSA operates a privately owned facility, GSA could potentially be responsible for conducting a preliminary assessment and site investigation.

Federal Facilities Reported on the Docket

EPA developed its initial docket list from its data base in 1988. This list is updated every six months. The docket contains information submitted by Federal agencies to EPA under sections 3005, 3010, and 3016 of the Resource Conservation and Recovery Act (RCRA) and under section 103 of CERCLA. The docket contains the facility name, address, the statutory provisions under which the facility was reported to EPA, the EPA region where the facility is located, and the date of the listing.

The following are Federal facilities that are reported on the docket and the provisions that require Federal agencies to report information to EPA:

- Facilities that temporarily store and dispose of hazardous waste (RCRA section 3005).
- Facilities that manifest hazardous waste (RCRA section 3010).
- Facilities required to inventory hazardous waste (RCRA section 3016).
- Facilities where reported releases of hazardous substances into the environment has occurred [CERCLA 103(a)].

Federal Facilities Not Included on the Docket

EPA does not include the following categories of facilities on the docket:

- Facilities formerly owned by a Federal agency and now privately owned. However, facilities that are now owned by another Federal agency will remain on the docket with the responsibility resting with the current owner.
- Small Quantity Generators, reported under RCRA section 3010 that have never produced more than 1000 kilograms/month of hazardous waste, are not listed unless there is reported release under CERCLA Section 103, or if hazardous waste activities occur that is pursuant to another reporting mechanism.
- Facilities that are solely transporters as reported under RCRA section 3010.

GSA REQUIREMENTS AND RECOMMENDATIONS

Updating of the Federal Docket

Central Office environmental team receive an update of the Federal docket every 6 months. This information is forwarded to each region for review. Each region must verify the following

1. Ownership of the listed property. If the property was owned by GSA and is now owned by another Federal agency, the property is listed on the docket as belonging to the current Federal owner. If the property was formerly owned by GSA and is now owned by a non-government agency, the property is removed from the docket.
2. That no small quantity generators have been included on the list. If the property is a small quantity generator of hazardous waste it need not be included on the docket list. If, however the small quantity generator has reported a spill under CERCLA 103, it must remain on the docket list.
3. Determine if the sole activity of the site is hazardous waste transport. The site can be removed from the docket if this is the reason the property is listed.

After reviewing the docket, regions must send any revisions to Central Office, who will forward all revisions to EPA.

Preliminary Assessment

GSA must perform a preliminary assessment (PA) of all its property appearing on the docket list. The PA must be completed within one year after it is identified. The PA is used to make an initial evaluation of the potential risk posed by a site and to make recommendations for further actions.

The PA involves determining the history of the site through interviews with past owners and employees, determining parties that may have contributed to the contamination of the site, reviewing any pertinent business documents, and doing a visual inspection of the site. Sampling for hazardous substances is usually not done at this stage.

A PA can be used to indicate further action or that no further action is required. If further action is required, a site investigation (SI) is done. The responsible GSA regional office person sends the PA to EPA. A copy must also be sent to the environmental team at Central Office. The PA form (EPA 2070-12) can be obtained from the EPA Office of Emergency and Remedial Response, Washington, DC 20460 or the Regional EPA office.

Site Investigations

If a Si is indicated in the PA, the Si must be done within one year after listing on the docket. The Si involves conducting a study to determine what hazardous substances are present and the extent of the contamination by collecting air, soil, water and bulk

samples. A geohydraulic study may be done to determine location of the ground water and direction of the water flow.

The SI should be done by a contractor that specializes in environmental assessment. The responsible GSA regional office person sends the SI to EPA. A copy must also be sent to the environmental team at Central Office. The SI form (EPA 2070-13) can be obtained from the EPA Office of Emergency and Remedial Response, Washington, DC 20460 or the Regional EPA office.

EPA ranks the site after receiving the results of the PA and SI. Refer to Technical Guidance E102 for further information on actions to take after the site is ranked.

REFERENCE

U.S. Environmental Protection Agency. Federal Facilities Compliance Strategy, EPA 130/4-89/003. Enforcement and Compliance Monitoring, Washington, DC, 1988.

Federal Register. Vol. 53, No. 228. Federal Agency Hazardous Waste Compliance Docket (November 18, 1988), pp. 46364-46366.

Technical Guide

FEDERAL FACILITIES HAZARDOUS WASTE ACTIVITIES INVENTORY

BACKGROUND

The Federal Facilities Hazardous Waste Activities Inventory is required under section 3016 of the Resource Conservation and Recovery Act (RCRA). This section requires all Federal agencies to submit to the Environmental Protection Agency (EPA) an inventory of each hazardous waste site the Federal agency owns or operates or has owned or operated. Federal agencies must also submit a copy of the questionnaire to the State if the facility is located in a State that has an authorized hazardous waste program (refer to Appendix A).

Facilities are included on the inventory when hazardous waste is stored, treated or disposed of on the property. The facility must be currently owned or operated or previously owned or operated by a Federal agency. Small quantity generators and one time disposal of hazardous wastes that exceed the small quantity generator limits are exempt from reporting. The statute specifies that this inventory must be completed and submitted to EPA and authorized States every two year. The reporting cycle began in January 1986.

DISCUSSION

Definitions for Inventory Purposes

A Federally Owned or Operated Facility is defined as all contiguous property owned and/or operated by a Federal agency at any one location and at which hazardous waste is stored, treated, or disposed, or has been disposed. The boundary of the Federal facility is the perimeter of the contiguous property owned or operated by the Federal agency, irrespective of the boundary of any Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites or RCRA facilities located on the property.

A RCRA facility is defined as all contiguous land, structures, other appurtenances, and improvements on the land, used for treating, storing, or disposing of hazardous

waste on or after November 19, 1980, for which a RCRA facility identification number has been assigned. A facility may consist of several treatment, storage, or disposal operation units.

A Formerly Owned or Operated Federal Facility includes all the contiguous property at any one location which was formerly owned or operated by a Federal agency and at which hazardous waste was disposed before or during the time of government ownership, or during the time of government operation.

Federal Facilities Reported on the Inventory

Federal agencies must submit information for currently owned sites where hazardous waste has been disposed, even if that disposal occurred before the Federal agency actually owned or operated the site. For formerly owned or operated Federal facilities, information must be submitted for any site at which hazardous waste was disposed before or during the time of government ownership, or during the time of government operation.

This regulation also requires that information be submitted on all solid waste management units, RCRA regulated units, and other areas where hazardous substances have come to be located. These include CERCLA sites and must be listed on the inventory whether or not they are listed on the National Priorities List. Small quantity generators and one time disposal of hazardous wastes that exceed the small quantity generator limits are exempt from reporting. Refer to GSA Environmental Management Technical Guide 201, Hazardous Waste, for more information on small quantity generators.

This requirement is not related to the Federal Facilities Docket. However, if a site is reported under Section 3016, it will be listed on the docket. Refer to GSA Safety and Environmental Management Technical Guide 205, Federal Agency Hazardous Waste Docket, for more information on the docket.

Information Required on Questionnaires

EPA requests the following information for facilities listed on the inventory:

- Description of the location of each site, the site hydrogeology and location of withdrawal wells and surface water within one mile of the site.
- The amount, nature, and toxicity of the waste.
- Known nature and extent of contamination.
- Current status of the site.

- List of disposal sites without environmental monitoring data and reasons for the lack of data.
- Response actions taken at the site.
- Identification of the processes used at the site.
- Name and address of the responsible Federal agency for each site.

GSA REQUIREMENTS AND RECOMMENDATIONS

Updating of the Inventory

Every two years, the Central Office Environmental team, receives questionnaires from EPA for sites that are on the inventory and blank questionnaires for sites to be included on the inventory. These questionnaires are forwarded to the regions for review and updating. Sites that have been previously reported on the inventory will have pre-printed questionnaires.

All questionnaires should be reviewed and completed by the person who is most familiar with the facility. After reviewing and updating the questionnaires, regions must return the questionnaires to the Central Office Environmental team, who will forward them to EPA. The region is also responsible for submitting a copy of the questionnaire to the appropriate State office, if the facility is located in a State authorized by RCRA. Authorized states are listed in Appendix A.

Regional personnel can call the Federal Facility Inventory Hotline, established by EPA, at (800) 254-3793, for assistance in completing the questionnaires.

REFERENCE

Resource Conservation and Recovery Act, Section 3016, [42 U.S.C. 69371, Inventory of Federal Agency Hazardous Waste Facilities.

APPENDIX A

Alabama
Land Division
Alabama Dept. of Env. Management
1751 Federal Drive
Montgomery, AL 36130

Arizona
Office of Waste Programs
Arizona Dept. of Env. Quality
2005 N. Central Avenue
Phoenix, AZ 85004

Arkansas
Hazardous Waste Division
Arkansas Dept. of Pollution Control and Ecology
P.O. Box 8913
Little Rock, AK 72219

California
Hazardous Waste Division
Dept. of Env. Protection
P.O. Box 2815
Sacramento, CA 95812

Colorado
Waste Management Division
Colorado Dept. of Health
421 0 E. 1 1 th Avenue
Denver, CO 80220

Connecticut
Hazardous Waste Division
Dept. of Env. Protection
79 Elm Street
Hartford, CT 06106

Delaware
Division of Air and Waste Management
Dept. of Natural Resources and Env. Control
P.O. Box 1401/89 Kings Highway
Dover, DE 19903

District of Columbia
Pesticides and Hazardous Materials
Division/Superfund
21 00 Martin Luther King Ave., S.W.
Washington, DC 20020

Florida
Division of Waste Management
Underground Storage Tanks
Dept. of Env. Regulations
2600 Blaire Stone Road
Tallahassee, FL 32399-2400

Georgia
Land Protection Branch
Industrial and Hazardous Waste Management
Program
Floyd Towers East
206 Buiter Street, SE
Atlanta, GA 30344

Guam
Hazardous Waste Management Program
Guam EPA
P.O. Box 2999
Agana, GU 96910

Idaho
Hazardous Materials Bureau
141 0 N. Hilton
Boise, ID 83706

Illinois
Illinois EPA
Division of Land Pollution Control
2200 Churchill Road
Springfield, IL 62706

Indiana
Indiana Dept. of Env. Management
105 S. Meridian Street/P.O. Box 6015
Indianapolis, IN 46206

Kansas
Bureau of Waste Management
Dept. of Health and Environment
Forbes Field, Building 321
Topeka, KS 66620

Kentucky
Division of Waste Management
Dept. of Env. Protection
Cabinet for Natural Resources and Env. Protection
19 Reilly Road
Frankfort, KY 40601

Louisiana
Hazardous Waste Division
Office of Solid Waste and Hazardous Waste
Louisiana Dept. of Env. Quality
P.O. Box 82178
Baton Rouge, LA 70884-2178

Maine
Bureau of Oils and Hazardous Materials Control
Dept. of Env. Protection
State House Station # 1 7
Augusta, ME 04333

Maryland
Hazardous Waste Program
Maryland Dept. of the Environment
2500 Browning Highway
Baltimore, MD 21224

Massachusetts
Division Hazardous Waste
Dept. of Env. Protection
One Winter Street, 5th Floor
Boston, MA 02108

Michigan
Waste Management Division
Michigan Dept. of Natural Resources
P.O. Box 30241
Lansing, MI 48909

Minnesota
Solid and Hazardous Waste Division
Minnesota Pollution Control Agency
520 Lafayette Road, North
St. Paul, MN 55155

Mississippi
Hazardous Waste Division
Office of Pollution Control
Dept. of Env. Quality
P.O. Box 10385
Jackson, MS 39289-0385

Missouri Waste Management Program
Dept. of Natural Resources
Jefferson Building, 205 Jefferson St.
P.O. Box 176
Jefferson City, MO 65102

Montana
Solid and Hazardous Waste Bureau
Dept. of Health and Env. Science
Cogswell Building
Helena, MT 59620

Nebraska
Hazardous Waste Management Section
Dept. of Env. Control
State House Station
P.O. Box 94877
Lincoln, NE 68509

Nevada
Bureau of Waste Management
Capital Complex
201 South Fall Street
Carson City, NV 89701

New Hampshire
New Hampshire Dept. of Env. Services Waste
Management Division 6 Hazen Drive
Concord, NH 03301-6509

New Jersey
Division of Waste Management
Dept. of Env. Protection
401 East State Street
Trenton, NJ 08625

New Mexico
Groundwater and Hazardous Waste Bureau Env.
Improvement Dept.
P.O. Box 968
Santa Fe, NM 87504-0968

New York
Division of Hazardous Substance Regulation
Dept. of Env. Conservation
50 Wolfe Road
Albany, NY 12233-72153

North Carolina
Hazardous Waste Section
Dept. of Env. Health and Natural Resources P.O.
Box 27687
Raleigh, NC 27611-7687

North Dakota
Division of Hazardous Waste Management and
Special Studies
Dept. of Health
1200 Missouri Avenue
Bismarck, ND 58502-5520

Ohio
Division of Solid and Hazardous Waste Management
Ohio EPA
1800 Watermark Drive
P.O. Box 1049
Columbus, OH 48266-0149

Oklahoma
Waste Management Services
Oklahoma State Dept. of Health
P.O. Box 53551
1000 N.E. 10th Street
Oklahoma City, OK 73117-1299

Oregon
Hazardous and Solid Waste Division
Dept. of Env. Quality
81 1 South West 6th Avenue
Portland, OR 97204

Pennsylvania
Bureau of Waste Management
Pennsylvania Dept. of Env. Resources
P.O. Box 2063/Fulton Building
Harrisburg, PA 17105-2063

Rhode Island
Division of Air and Hazardous Waste
Dept. of Env. Management
291 Promenade Street
Providence, RI 02908

South Carolina
Bureau of Solid Waste Management
Hazardous Waste Management
Dept. of Health and Env. Control
2600 Bull Street
Columbia, SC 29201

South Dakota
Office of Air Quality and Solid Waste
Dept. of Water and Natural Resources
523 East Capital
Pierre, SD 57501

Tennessee
Division of Solid Waste Management
Tennessee Dept. of Public Health
701 Broadway
Customs House
Nashville, TN 37219-5403

Texas
Hazardous and Solid Waste division
Texas Water Commission
P.O. Box 13087, Capital Station
Austin, TX 78711-3087

Utah
Solid and Hazardous Waste
Division of Env. Health
P.O. Box 16690
Salt Lake City, UT 84116-0690

Vermont Hazardous Materials Management Division
Vermont Agency of Natural Resources
Dept. of Env. Conservation
103 S. Main Street, West Building Waterbury, VT
05671-0404

Virginia
Division of Technical Services Virginia Dept. of
Waste Management Monroe Building 1 0 1 N. 1 4th
Street
Richmond, VA 23219

Washington
Solid and hazardous Waste Management Division
Dept. of Ecology
Olympia, WA 98504

West Virginia
Waste Management Division
Dept. of West Virginia Natural Resources
State Capital Complex
1900 Kanawha Building,
East Charleston, WV 25305

Wisconsin Bureau of Solid waste Dept. of Natural
Resources
P.O. Box 7921
Madison, WI 53707

Technical Guide

INDOOR AIR QUALITY

BACKGROUND

The General Services Administration's Indoor Air Quality (IAQ) business practice is directed at maintaining acceptable indoor air quality at GSA-owned facilities, leased space, and delegated facilities. The GSA IAQ program has both an on-going and a proactive component. The on-going portion calls for the facility manager to provide prompt response to complaints and, when possible, implement controls to correct problems that are discovered. The proactive portion calls for conducting IAQ assessments as part of the safety and environmental management survey program. An overview of the program logic is provided in Figures 1 and 2.

DISCUSSION

- A. In concert with tenant agencies, GSA will ensure that buildings and space assigned to agencies provide a safe and healthful work environment.
- B. GSA-owned facilities and leased space, including delegated space, will be operated in accordance with the temperature and building operating criteria contained in 41 CFR Part 101-20, of the Federal Property Management Regulations (FPMR).
- C. All GSA buildings shall be assessed for indoor air quality. Such assessments will be conducted as part of GSA's scheduled environmental management survey program.
- D. When assessments identify problems that cannot be corrected through changes in building operating procedures, more detailed studies will be undertaken. Where possible, control of contaminants will be done at the source.
- E. Implementation of the program, response to occupant complaints, and implementing corrective actions will be carried out by the appropriate field office manager. Occupant complaints shall be kept in a log (manual or computer based) and maintained at each field office.

GSA REQUIREMENTS/RECOMMENDATIONS

Indoor air quality assessments for GSA-owned, leased and delegated space must be conducted by an industrial hygienist, environmental scientist, safety engineer or other person qualified by training and experience. Corrective actions associated with IAQ deficiencies shall be entered into the Safety and Environmental Management Information (SAFE) System unless they are abated during the initial response.

Records of all surveys, sampling results, assessments and control/abatement actions implemented in GSA-owned or leased space must be maintained in a permanent file in the appropriate field office.

If unsatisfied with GSA's resolution, tenant agencies are responsible for investigating IAQ complaints of their employees and rectifying identified problems.

I. ASSESSMENT PROCEDURES**A. SCHEDULED SAFETY AND ENVIRONMENTAL MANAGEMENT SURVEYS**

All scheduled (once in 5 year) surveys should consist of the following steps:

1. An entrance and exit briefing with the field office manager.
2. A review of the building's HVAC plans, if available. This should include a review of any renovations to existing systems.
3. Review of equipment maintenance and testing records for the last 12 months.
4. Review of the building layout to identify the location of GSA-occupied spaces and the areas that service them.
5. Review of the occupant complaint log.
6. Walkthrough inspection.
7. Occupant interviews.
8. Identification of external and internal contaminant sources.
9. Check of the mechanical rooms that service the ventilation system, check of cooling towers, outside air intakes.

10. Sample for carbon dioxide on each floor. Choose the most densely populated area that is representative of office spaces in the building. Each carbon dioxide measurement must be accompanied by the following data (room # and floor, sq. footage of the area, temperature of the area, relative humidity of the area, and an air velocity reading). The best time to take this reading is early afternoon following the lunch break. In any case, the time of the carbon dioxide measurement should be recorded. A test of the carbon dioxide concentration ambient outside air will serve as a control.

11. Check for visible mold growth and damp or wet areas.

B. UNSCHEDULED ASSESSMENTS

The format of these assessments will vary with the nature of the IAQ complaint. Carbon dioxide reading, if taken require the same information provided for scheduled surveys.

II. GSA INDICATOR LEVELS FOR INDOOR AIR CONTAMINANTS

CONTAMINANT	AREA	GSA INDICATOR LEVEL	REFERENCE
CARBON MONOXIDE	SHOPS	17.5ppm (TWA)	50% OF OSHA TWA
CARBON MONOXIDE	OFFICES	9.Oppm	NAAQS +
CARBON DIOXIDE	ALL	1000.Oppm (TWA)	ASHRAE*
FORMALDEHYDE	SHOPS	0.5ppm (TWA)	OSHA ACTION LEVEL
FORMALDEHYDE	OFFICE	0. 1 ppm (TWA)	NIOSH

* ASHRAE research and consensus standard, used as an indicator of inadequate ventilation

+ NAAQS - national ambient air quality standard

LEGEND:

Indicator level	The level that requires appropriate response action when reached
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPM	Parts per million
TWA	Time weighted average (8-hour sample)

REFERENCES

Ventilation for Acceptable Indoor Air Quality. ASHRAE 62-1989. American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.

Building Air Quality: A Guide for Building Owners and Facility Managers.
Environmental Protection Agency.

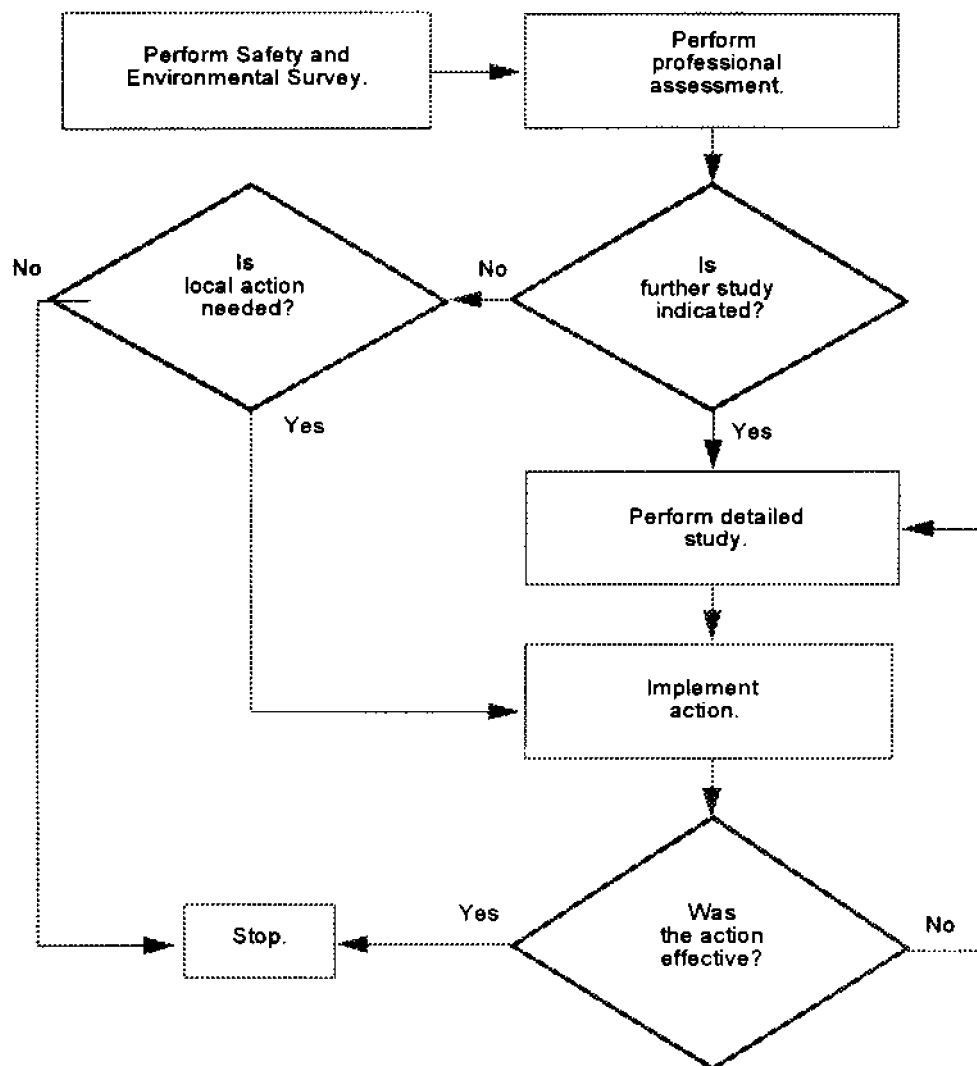


Figure 1
Indoor Air Quality Program—
Proactive Element

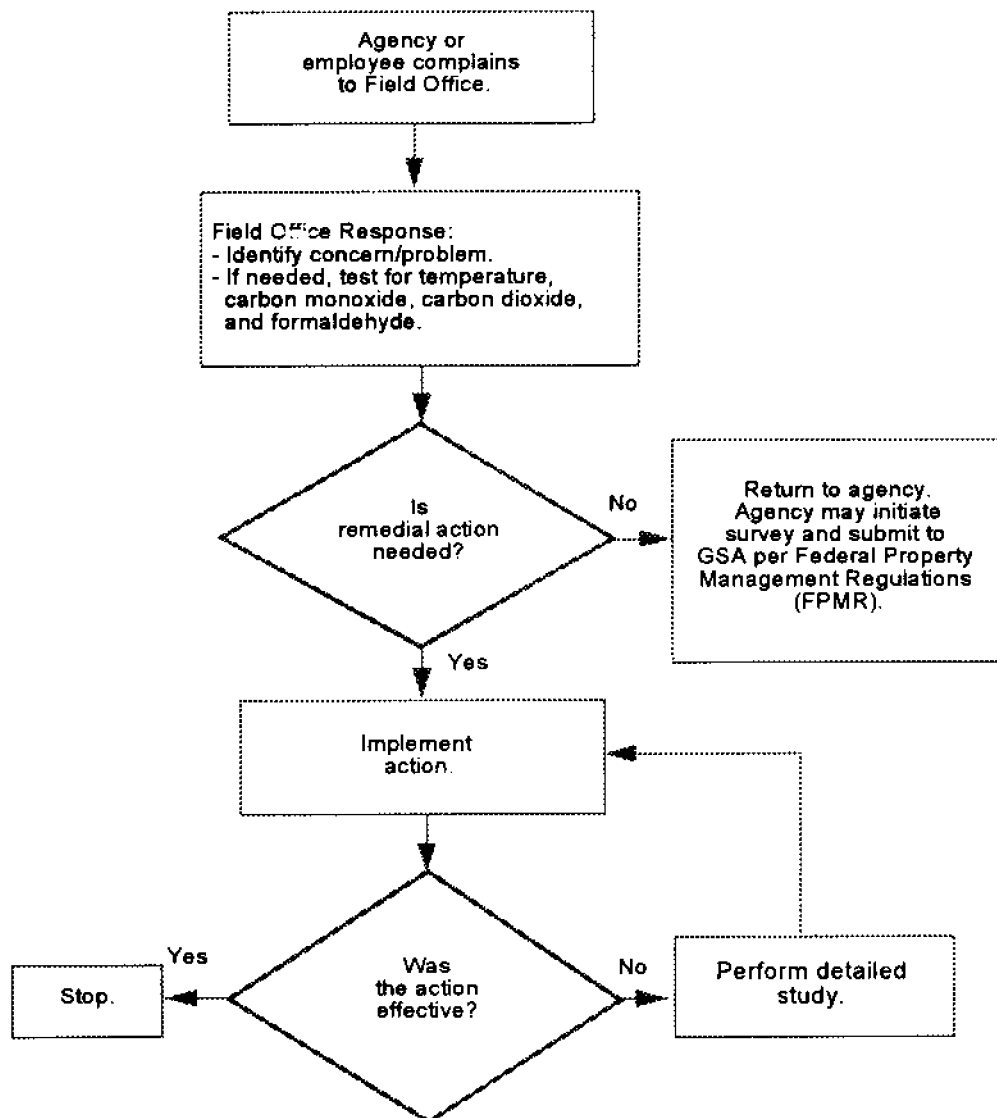


Figure 2
Indoor Air Quality Program—
Ongoing Element

Technical Guide

LEAD-BASED PAINT IN CHILD CARE CENTERS

BACKGROUND

This guide gives the General Services Administration (GSA) direction on lead-based paint in child care centers, health effects of lead exposure, testing procedures, abatement methods, and clean-up and disposal requirements. This information can be used by Safety and Environmental Management personnel when making decisions concerning lead-based paint in child care centers. References are listed for more detailed information on these topics.

Test all painted surfaces in proposed or current child care centers for lead. If lead-based paint is detected in a child care center, then the paint must be abated by methods specified in the Department of Housing and Urban Development (HUD) guidelines on testing and abatement of lead-based paint (i.e., replacement, encapsulation, or paint removal).

Locations must have all lead-based painted surfaces abated before the child care center opens, or abated as soon as possible if the facility is already opened. Children will not be allowed in the center while the lead abatement project is being performed and until the clearance criteria has been met.

DISCUSSION

Sources and Locations of Lead-Based Paint

Lead was a major ingredient in many paints before World War II. In the early 1950s other pigment materials became more popular, but lead compounds were still used in some pigments and as drying agents in alkyd oil-based paint. Latex water-based paints generally did not contain lead. The manufacture of residential lead-based paint was banned by the Consumer Product Safety Council in 1978.

Any building constructed before the 1980s may contain lead-based paint. Lead-based paint may be on any interior or exterior surface, particularly on woodwork, doors, and windows. Lead is still used in industrial and marine paints as a rust inhibitor. Currently, lead-based paint is primarily used on steel structures such as bridges, ships, and the exterior of water tanks.

Health Effects of Lead Exposure

The health risk from lead-based paint has been recognized since the 1800's, but the level lead becomes dangerous is still being debated. Children have been found to suffer irreversible physical and mental changes at levels that once were considered safe.

For example, in 1960 a child with a blood lead level of 60 micrograms per decaliter ($\mu\text{g}/\text{dl}$) was considered to be lead poisoned; in 1991 the Centers for Disease Control lowered this level to 10 $\mu\text{g}/\text{dl}$.

Young children, infants, and fetuses are particularly vulnerable to lead. The physical and behavioral effects of lead occur at lower exposure levels in children than in adults. Exposure to lead levels that would have little effect on an adult can have a significant effect on a child.

Young children, less than six years, are at higher risk since they often play on the floor where lead dust gathers. Also children tend to place objects in their mouths, such as paint chips or objects that can be contaminated with lead dust. Low levels of lead exposure in children have been linked to damage to the central and peripheral nervous system, learning disabilities, shorter stature, impaired hearing, and impaired formation and function of blood cells.

Many children with lead poisoning have no symptoms; others have only nonspecific symptoms such as headaches, stomachaches, or irritability. At its worst, lead poisoning can result in kidney damage, stupor, coma, or severe brain damage. A blood test is used to determine if a child has been poisoned by lead.

The Occupational Safety and Health Administration (OSHA) Regulations

On June 3, 1993, the OSHA interim final standard regulating occupational exposure to inorganic lead in construction, 29 Code of Federal Regulations (CFR) 1926.62, went into effect. Under this standard, the Permissible Exposure Limit for inorganic lead is 50 $\mu\text{g}/\text{m}^3$ of air as an 8-hour time-weighted average and an action level of 30 $\mu\text{g}/\text{m}^3$ as an 8-hour time-weighted average. This standard has provisions for exposure monitoring, engineering and work practice controls, training, medical monitoring, medical removal, record keeping, and job removal. These provisions are discussed in GSA Safety and Environmental Management Lead-Based Paint Technical Guide, E402.

State Regulations

The States of Maryland and Massachusetts have passed regulations on abating lead-based paint, and legislation is pending in several states. GSA Safety and Environmental Management personnel should check with their state environmental

or occupational safety and health offices to determine if there are any state requirements for abatement or disposal of lead-based paint.

Department of Housing and Urban Development (HUD) Guidance on Lead-Based Paint Abatement

In 1989, Congress directed HUD to develop guidance for testing, abatement, cleanup and disposal of lead-based paint in public and Indian housing. In 1990, HUD issued interim guidelines on testing and abatement of lead-based paint (reference 1). This is currently the most widely accepted guidance available on lead-based paint abatement techniques. The HUD guideline has stringent requirements and is aimed at preventing lead poisoning in children.

REQUIREMENTS AND RECOMMENDATIONS

Testing and Definition of Lead-Based Paint

HUD defines lead-based paint as any paint containing lead measured at 1.0 milligram per square centimeter (mg/cm²) by a x-ray fluorescence analyzer or 0.5 percent by weight by laboratory testing. Testing for the presence of lead-based paint should be done using either x-ray fluorescence analyzer or laboratory analysis of paint samples.

On-site X-ray Fluorescence Analyzer Testing

The x-ray fluorescence analyzer works by x-raying the paint, which causes lead to emit a characteristic frequency of radiation. The detector measures the frequency and correlates it with the amount of lead in the paint.

There are two types of x-ray fluorescence analyzer detectors available: direct readers and spectrum analyzers. Direct reading x-ray fluorescence analyzer provides the operator with a direct readout of lead concentration in the paint. Spectrum x-ray fluorescence analyzer provide a complete radiation spectrum, analyzed by the instrument's software to improve the accuracy of the lead measurement. The spectrum x-ray fluorescence analyzer is more accurate than the direct reader, but it is more expensive and produced by only one manufacturer.

X-ray fluorescence analyzer sampling is preferred by HUD since it is relatively inexpensive, provides rapid results and does not require removal of paint for most samples. For more information on how and where to take measurements, refer to Appendix 4 of the HUD Interim Guidelines (reference 1).

Laboratory Analysis of Paint

Paint samples are analyzed in a laboratory to determine the concentration of lead. The two types of laboratory methods used for the analysis of paint are atomic absorption spectrometry and inductively coupled plasma-atomic emission

spectrometry. The advantages of laboratory testing are that it is more accurate than x-ray fluorescence analyzer and can be used to confirm inconclusive x-ray fluorescence analyzer measurements. The disadvantages are that laboratory testing is expensive, the turn-around time for analysis may be slow, and the method requires the removal of paint.

If laboratory results are reported in mg/cm², the paint must be removed down to the bare substrate from a measured surface area. Accurate determination of the surface area is important, but adhered substrate or other non-paint material will not affect the result.

If laboratory results are reported as weight percent, the paint must be removed down to, but not including, the bare substrate. Inclusion of substrate materials in the paint sample or not removing all paint will dilute the results. For more information on how and where to collect samples, refer to Appendix 5 of the HUD Interim Guidelines (reference 1).

Any laboratory used should be accredited by the American Industrial Hygiene Association and participate in the Environmental Lead Laboratory Accreditation Program for paint samples and dust wipes for lead analysis.

Interior Abatement Strategies

The three general strategies for lead-based paint abatement are replacement, encapsulation and paint removal. When deciding which method(s) to use, the advantages, disadvantages, and costs of each strategy should be considered. Estimated average cost for each abatement method is presented in Figure 1.

The following methods of lead-based paint removal should not be used: open flame burning, dry scraping, and machine sanding without attached high efficiency particulate absolute (HEPA) filtration.

Replacement

Replacement refers to the removal of components that are covered with leadbased paint, such as windows, doors, and trim, and installing new components without lead-based paint. Replacement can be done on many exterior and interior components, but not for most walls, ceilings, and floors. Replacement is a permanent solution and offers these advantages:

- Integrates well with renovation and modernization projects.
- Replacement may increase energy efficiency. For example, replacement windows can be more energy efficient than the original windows.

- Allows for the upgrading of components.
- No lead residue is left behind on surfaces.

The disadvantages of replacement are:

- The cost is high if replacement is done outside the context of a large-scale rehabilitation project.
- Replacement components may be of lower quality than the original components.
- Adjacent surfaces may be damaged. For example, plaster walls can be damaged when baseboards are removed.
- Reinstallation of certain components requires skilled carpentry.
- A large volume of abatement debris may be generated.
- Nonstandard replacement parts may require special orders and additional ordering time

Encapsulation

Encapsulation refers to making lead-based paint inaccessible by covering or sealing painted surfaces. Encapsulation is a good method for large surfaces such as walls, ceilings and floors. Methods also exist to encapsulate interior and exterior walls, pipes, exterior and some interior trim.

Encapsulants require periodic inspection and may require routine maintenance. Only encapsulants that have been proven to be durable, impregnable to young children, vermin-proof and fire-resistant should be used. A new coat of paint or primer, paper wall coverings, or contact paper should not be used as an encapsulant.

Gypsum dry wall and exterior siding are very durable encapsulants. Sheet rock, vinyl wall covering, and wood paneling can also be used. Tile, wood, stone and vinyl coverings can be used to seal lead paint on floors. If any of these materials is used, the appropriate fire protection characteristics should be considered.

Well-prepared surfaces are important to the durability and integrity of the encapsulating system. For example, peeling lead paint on walls should be removed by scraping before encapsulation. Misting of peeling paint before scraping to prepare for encapsulation is an inexpensive and effective method for

reducing the amount of lead dust generated. Surfactants (wetting agents) may be added to the water to ease cleanup.

Documentation of encapsulation is important since there is the potential for exposures to underlying lead-based paint during maintenance and renovation activities. Problems may also arise during future lead paint inspection activities because encapsulated lead paint can be detected by x-ray fluorescence analyzer.

Off-site Paint Removal

Off-site chemical removal is the stripping of lead paint from a building component at a professional paint stripper facility. Stripping is done in special chemical tanks. Some considerations are:

- The quality of the finished product is usually better than for on-site removal.
- Possible damage to components or adjacent surfaces during removal and reinstallation of the components, and to hardware left on components during removal.
- Possible swelling of some components, which may make reinstallation difficult.
- Lead residue may remain on the substrate, which makes components difficult to handle and clean.

On-site Paint Removal

All on-site paint stripping methods/materials are potentially hazardous and should be used with care. On-site removal does not require highly skilled labor, but most on-site removal methods leave lead residue on substrates and may be difficult to remove. General methods are:

- Heat Guns - Heat guns are used to soften paint on flat surfaces, which is then scrapped off. This method works best when the paint is thick, and can be used on floors that are preserved for aesthetic reason. Heat guns can be very dangerous and may pose a potential fire hazard if not used carefully. Noxious organic vapors are formed from the thermal decomposition of the paint film while using heat guns. Good ventilation is required, such as open windows and exhaust fans. A respirator equipped with a combination HEPA and organic vapor cartridges should be worn. Heat guns should not be operated at more than 700°F.

- HEPA Sanders - HEPA sanders are equipped with a special, high efficiency, vacuum that filters out lead particles. The HEPA sander is recommended only for limited surface areas. The potential for generation of lead dust increases when the sanding disk is wider than the surface being abated because the sanding shroud is not always in contact with the surface. It works best on flat surfaces, such as jambs or stair risers. Other types of sanders or filters cannot be used to remove lead-based paint.
- Chemical Strippers - Chemical strippers work best on metal substrates. An exception is that caustics should not be used on aluminum. Chemical strippers may require multiple applications depending on the number of layers of paint.

Some solvent-based chemical strippers may be flammable and/or contain toxic substances. The Material Safety Data Sheet must be obtained for any stripper considered for use and reviewed. Most chemical strippers require good ventilation with open windows and exhaust fans. Removers that contain methylene chloride should not be used since this chemical is a suspect carcinogen.

Caustic chemical strippers can cause skin and eye injuries if not used properly. Review the Material Safety Data Sheet to determine what personal protective equipment is necessary. Also, the high pH of caustic strippers may require that the waste from the strippers be classified as a hazardous waste, regardless of the lead content.

The process of washing and neutralizing substrates on which caustic chemicals have been used can create large quantities of lead-bearing liquid waste. This is caused by the large amount of lead residues left on the surface by this method. Any surfaces that have been stripped with caustic chemicals or that have come into contact with this liquid waste should be cleaned by wet washing until there is no visible residue.

Clean-Up and Disposal

Daily cleanup activity is important throughout the abatement process. Early removal of dust from the work area will reduce the potential for recontaminating the property. The final cleanup should start no sooner than 24 hours after active abatement has ceased to assure that all airborne lead dust has settled out.

All surfaces from which lead-based paint have been stripped will be coated with a residue of lead dust that is very difficult to remove. Unless cleanup is thorough and complete, large amounts of nearly invisible lead dust can become embedded in

the new paint. This lead can be remobilized rather quickly if it is present on surfaces subject to abrasion, such as windows.

The most effective cleaning involves dry cleaning using a HEPA vacuum and wet cleaning using a high-phosphate detergent. At the conclusion of the abatement process, all surfaces in the abatement area should be HEPA-vacuumed. These surfaces include ceilings, walls, floors, windows, doors, fixtures of any kind, builtin cabinets, and appliances. Also, clean surfaces that were not painted with leadbased paint but were exposed to lead dust generated by the abatement process. Vacuum rooms by starting with the ceilings and working down to the floors.

After the first HEPA vacuuming, all surfaces should be washed with a highphosphate solution. Detergents containing at least 5% trisodium phosphate have been found to be most effective. Workers should wear waterproof gloves since trisodium phosphate is irritating to the skin. Clean the same surfaces that were cleaned with the HEPA vacuum.

Special care must be taken in removing lead contaminated waste from the work site to avoid environmental contamination or injury to workers or building occupants. While in the work area, the exterior of the filled waste containers should be HEPA vacuumed and wet-wiped to remove residual contamination. If plastic bags are used, they should be bagged again as they come out of the work area.

Waste should be removed from work areas when use of the hallways and staircases is low. The path from the work area to the truck or dumpster should be planned to minimize contacts with building occupants and to ensure access to freight elevators or loading docks.

Containers should be moved and packed in the truck with care. When possible, hand trucks, dollies, or pull carts should be used, along with ramps or trucks with lift gates. These procedures will help minimize container breakage.

Dispose of lead-containing paint chips, debris and waste water in accordance with Environmental Protection Agency (EPA), State and local regulations. EPA requires that representative lead abatement wastes be tested to determine if materials are regulated under the Resource Conservation and Recovery Act (RCRA), 40 CFR Part 261.

Use the Toxicity Characteristic Leaching Procedure to determine if a lead contaminated material is covered under RCRA. The Toxicity Characteristic Leaching Procedure is designed to determine the amount of lead that could be leached out if the waste came into contact with ground water at a municipal waste dump. If the Toxicity Characteristic Leaching Procedure determines that the

lead concentration is 5 parts per million or greater, the waste is regulated by RCRA. Hazardous waste must be disposed of at an EPA approved hazardous waste disposal facility. The hazardous waste disposal facility must have an EPA identification number and authorization to operate. Ensure that the hazardous waste transporter has an EPA identification number and meets the U.S. Department of Transportation requirements for shipping containers.

Refer to GSA Environmental Management Hazardous Waste Technical Guide E201, the HUD Guidelines (reference 1), and the EPA report "Applicability of RCRA Disposal Requirements to Lead-Based Paint Abatement Wastes" (reference 5) for more information on hazardous waste regulations.

Clearance Testing

Clearance testing is done with wipe sampling. Wipes consists of commercial wipes moistened with a non-alcohol wetting agent. Detailed guidance on surface wipe sampling is provided in Section A-5.4 of the HUD guidelines.

Lead levels must meet the following clearance criteria:

Floors:	200 micrograms per square foot
Window Sills:	500 micrograms per square foot
Window Wells:	800 micrograms per square foot

The cleaning cycle of HEPA vacuuming and washing may have to be repeated several times to meet the clearance criteria.

Worker Protection

Requirements to comply with OSHA regulations, engineering controls, work practices, personal protection, training, medical surveillance, and employee exposure assessment are covered in GSA Safety and Environmental Management Lead-Based Paint Technical Guide, E402.

REFERENCES

1. Federal Register, 18 April 1990, Vol. 55, No. 75, Department of Housing and Urban Development, Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, as amended, September 1990, Office of Public and Indian Housing, Department of Housing and Urban Development, 451 Seventh Street, SW, Washington, DC 20410. (1-800-245-2691).

2. Maryland Department of the Environment, Lead Paint Hazard Fact Sheets 1 - 7, November 1989, Center for Environmental Health, Maryland Department of the Environment, 2500 Broening Highway, Baltimore, MD 21224, (301) 631-3859.
3. U. S. Department of Labor. Occupational Safety and Health Administration. Safety and Health Regulations for Lead in Construction. 29 CFR 1926.62.
4. National Institute for Occupational Safety and Health, Health Hazard Evaluation Report, HUD Lead-Based Paint Abatement Demonstration Project, HETA 90-0702181, February 1992.
5. Environmental Protection Agency. Office of Pollution Prevention and Toxics. "Applicability of RCRA Disposal Requirements to Lead-Based Paint Abatement Wastes," March 1993.
6. Department of Housing and Urban Development. Office of Policy Development and Research. The HUD Lead-Based Paint Abatement Demonstration (FHA) Report. Washington, DC, August 1991.

ESTIMATED AVERAGE COST

Encapsulation

Direct Material: \$0.18 - 0.24 per square foot

Direct Labor: \$0.40 - 3.50

Enclosure

Direct Material: \$0.68 - 1.00 per square foot

Direct Labor: \$0.50 - 5.00

Chemical

Direct Material: \$1.68 - 2.50 per square foot

Direct Labor: \$2.00 - 5.00

Hand-Scrapping

Direct Material: \$0.02 - 4.00 per square foot

Direct Labor: \$0.50 - 10.00

Replacement Trim

Direct Material: \$2.00 - 4.00 per linear foot

Direct Labor: \$1.00

Reglacement Windows

Direct Material: \$105.00 - 135.00 per window

Direct Labor: \$25.00 - 30.00 per window

Reglacement Doors (interior)

Direct Material: \$30.00 - 50.00 per door

Direct Labor: \$10.00 - 15.00 per door

Replacement Doors (Exterior)

Direct Material: \$90.00 - 200.00 per door

Direct Labor: \$35.00 - 40.00 per door

Source: The HUD Lead-Based Paint Abatement Demonstration Report (reference 6).

Figure 1

Technical Guide

LEAD-BASED PAINT

BACKGROUND

This guide gives the General Services Administration (GSA) direction on lead-based paint, an overview of the Occupational Safety and Health Administration (OSHA) lead in construction regulation, and the hazards of abating lead-based paint. This information can be used by Safety and Environmental Management personnel when making decisions concerning lead-based paint. References are listed for more detailed information on these topics.

GSA's policy is to test for lead-based paint whenever a renovation project requires sanding, welding or scraping painted surfaces. Lead-based paint should not be abated if the painted surfaces are intact and in good condition. Follow the Occupational Safety and Health Administration requirements if lead is detected. Refer to Figure 1 for a flow chart for GSA lead-based paint program.

Test all painted surfaces in proposed or current child care centers for lead. If lead-based paint is detected in a child care center, then the paint must be abated by methods specified in the Department of Housing and Urban Development (HUD) guidelines. Refer to GSA Environmental Management Lead-Based Paint in Child Care Centers Technical Guide E401 for more information.

DISCUSSION

Sources of Lead in the Workplace

The degree of harm from lead depends upon the total exposure from all sources. Varying concentrations of lead can be found in air, soil, dust, food, and water. Lead has been added to many commercial products, including paint, solder, plumbing, ammunition, and gasoline.

Most adults who are exposed to lead receive their greatest exposure in the workplace while performing industrial activities. Workers can be exposed to lead from painting, removing lead-based paint, manufacturing lead products, and welding or cutting on materials such as lead bearing steel, steel that has been galvanized, zinc-silicate coated, or metal painted with lead-based paint.



Lead was a major ingredient in many paints before World War II. In the early 1950s other pigment materials became more popular, but lead compounds were still used in some pigments and as drying agents in alkyd oil-based paint. Latex water-based paints generally did not contain lead. The manufacture of residential lead-based paint was banned by the Consumer Product Safety Commission in 1978.

Any building constructed before the 1980s may contain lead-based paint. Lead-based paint may be on any interior or exterior surface, particularly on woodwork, doors, and windows. Lead is still used in industrial and marine paints as a rust inhibitor. Currently, lead-based paint is primarily used on steel structures such as bridges, ships, and the exterior of water tanks.

Health Effects of Lead Expos

Lead poisoning was one of the first recognized occupational related diseases. The National Institute for Occupational Safety and Health (NIOSH) has conducted studies in industry to determine the health effects of overexposure to lead. They have determined that many adults with blood lead levels of 80 micrograms per decaliter (jig/dl) or greater have symptoms or signs of acute lead poisoning, although in some individuals, symptoms may be so mild they are overlooked.

Common symptoms of acute lead poisoning are loss of appetite, nausea, vomiting, stomach cramps, constipation, difficulty in sleeping, fatigue, moodiness, headache, joint or muscle aches, anemia, and decreased sexual drive. Severe health effects of acute lead exposure include damage to the nervous system, wrist or foot drop, tremors, and convulsions or seizures. Acute lead poisoning from uncontrolled occupational exposures has resulted in death.

An adult who is exposed to low or moderate levels of lead over a long time may develop chronic lead poisoning. The early effects of lead poisoning are not specific and may include fatigue, irritability, headache, weight loss, stomach ache, or constipation. Lead can also cause damage without any symptoms. Lead poisoning can affect learning ability, hearing, coordination, the formation of blood cells, cause hypertension, and can damage the kidneys, digestive system, and reproductive systems. These health effects may occur at blood lead levels below 50 /ig/dl.

Chronic lead poisoning may also result after lead has accumulated in the body over time, mostly in the bone. Long after exposure has ceased, some physiological event such as illness or pregnancy may release this stored lead from the bone and produce adverse health effects.

Pregnant women and their unborn children are of special concern. Fetal development and viability can be affected by exposure to lead at blood lead levels of 10 to 15 $\mu\text{g}/\text{dl}$. Prenatal exposure to low lead levels increases the risk of premature birth, reduced birth weight, stillbirth and neurobehavioral deficits. Lead is considered to be an animal teratogen (a cause of birth defects) and may be related to minor malformations in humans. Some studies have suggested that chronic exposure to lead may result in male infertility,

Young children and infants are particularly vulnerable to lead. Physical and behavioral effects of lead occur at lower exposure levels in children than in adults. Low levels of lead exposure in children have been linked to damage to the central and peripheral nervous system, learning disabilities, shorter stature, impaired hearing, and impaired formation and function of blood cells.

The Occupational Safety and Health Administration (OSHA)

On June 3, 1993, the OSHA interim final standard regulating occupational exposure to inorganic lead in construction, 29 Code of Federal Regulations (CFR) 1926.62, went into effect. Under this standard, the Permissible Exposure Limit for inorganic lead is 50 $\mu\text{g}/\text{m}^3$ of air as an 8-hour time-weighted average and an action level of 30 $\mu\text{g}/\text{m}^3$ as an 8-hour time-weighted average. This standard has provisions for exposure monitoring, engineering and work practice controls, training, medical monitoring, medical removal, record keeping, and job removal. These provisions are discussed in this technical guide.

State Regulations

The States of Maryland and Massachusetts have passed regulations on abating lead-based paint, and legislation is pending in several states. Safety and Environmental Management personnel should check with their state environmental or occupational safety and health offices to determine if there are any state requirements for abatement or disposal of lead-based paint.

Department of Housing and Urban Development (HUD) Guidance on Lead-Based Paint Abatement

In 1989, Congress directed HUD to develop guidance for testing, abatement, cleanup and disposal of lead-based paint in public and Indian housing. In 1990, HUD issued interim guidelines on testing and abatement of lead-based paint (reference 1). This is currently the most widely accepted guidance available on lead-based paint abatement techniques.

HUD defines lead-based paint as any paint containing lead measured at 1.0 milligram per square centimeter (mg/CM^2) by a x-ray fluorescence analyzer or 0.5 percent by weight by laboratory testing. Testing for the presence of lead-based

paint should be done using either x-ray fluorescence analyzer or laboratory analysis of paint samples.

The HUD guideline has stringent requirements and is aimed at preventing lead poisoning in children. Some of the information in the guideline has universal application, such as choosing an abatement strategy, cleanup, waste disposal, and laboratories for paint and blood lead analysis, and should be used by Safety and Environmental Management personnel when making decisions about lead-based paint abatement.

GSA REQUIREMENTS AND RECOMMENDATIONS

Pre-Evaluation Surveys

In designing any renovation project that requires sanding, welding or scraping painted surfaces, regional Safety and Environmental Management personnel or their contractors must survey the site. Safety and Environmental Management personnel or their contractors should determine the following:

- whether painted surfaces contain lead
- whether lead-based paint abatement needs to be done

Recommendations, based on this survey, should be made to the project manager concerning what abatement procedures should be used. As general guidance, lead-based paint should not be abated if the painted surfaces are intact and in good condition. Lead-based paint does not present a hazard to adults unless lead particles are released, which occurs if a painted surface is sanded, welded or scraped.

The most cost effective way to identify lead-based paint in a pre-evaluation survey is to use a x-ray fluorescence analyzer. A x-ray fluorescence analyzer will often give inconclusive results at lead levels of 1.5 mg/cm² and below. If results are inconclusive, the surveyor must determine whether to take paint samples or assume the paint contain lead based on the age of the structure, painting history, or other x-ray fluorescence analyzer samples.

The HUD definition for lead-based paint can only be used in determining if paint should be abated in a child care center or residence. OSHA does not define lead-based paint, but instead bases all of its requirements on airborne lead levels that occur during the actual work. OSHA's reason is that there is no reliable connection between lead concentration in paints or coatings and airborne lead levels. Several studies have tried to link surface concentration to airborne concentration, but the results have been too variable to apply.

For example, in the preamble to 29 CFR 1926.62, published in the May 4, 1993, Federal Register, OSHA discusses a study performed by the state of California. Airborne lead levels were measured in different lead abatement methods for paint with a lead content of 1 mg/cm². Wet scrapping resulted in airborne lead levels of 37 µg/m³ and dry scrapping of the same surface resulted in airborne lead levels of 371 µg/m³.

Since OSHA is not setting a surface lead content trigger, Safety and Environmental Management personnel must ensure that an employee exposure assessment is performed if lead is detected in paint. For certain tasks, OSHA assumes lead levels will exceed the lead action level and specific requirements take effect. Refer to the discussion in the employee exposure assessment and identified tasks sections of this technical guide for more information.

A pre-evaluation survey should also be done when small, short duration maintenance tasks are performed by GSA employees that disturb painted surfaces. Examples of these tasks include removing window sills, doors, or surface preparation for painting. Maintenance personnel should contact their regional Safety and Environmental Management personnel on sampling procedures.

If a contractor is used to perform the work for the renovation project, the contractor is responsible for following the requirements given in 29 CFR 1926.62.

On-site X-ray Fluorescence Analyzer Testing

The x-ray fluorescence analyzer works by x-raying the paint, which causes lead to emit a characteristic frequency of radiation. The detector measures the frequency and correlates it with the amount of lead in the paint. There are two types of x-ray fluorescence analyzer detectors available: direct readers and spectrum analyzers.

Direct reading x-ray fluorescence analyzer provides the operator with a direct readout of lead concentration in the paint. Spectrum x-ray fluorescence analyzer provide a complete radiation spectrum, analyzed by the instrument's software to improve the accuracy of the lead measurement. The spectrum x-ray fluorescence analyzer is more accurate than the direct reader, but it is more expensive and produced by only one manufacturer.

X-ray fluorescence analyzer sampling is preferred by HUD since it is relatively inexpensive, provides rapid results and does not require removal of paint for most samples. For more information on how and where to take measurements, refer to Appendix 4 of the HUD Interim Guidelines (reference 1).

Laboratory Analysis of Paint

Paint samples are analyzed in a laboratory to determine the concentration of lead. The two types of laboratory methods used for the analysis of paint are atomic absorption spectrometry and inductively coupled plasma-atomic emission spectrometry. The advantages of laboratory testing are that it is more accurate than x-ray fluorescence analyzer and can be used to confirm inconclusive x-ray fluorescence analyzer measurements. The disadvantages are that laboratory testing is expensive, the turn around time for analysis may be slow, and the method requires the removal of paint.

If laboratory results are reported in mg/cm², the paint sample must be removed down to the bare substrate from a measured surface area. Accurate determination of the surface area is important, but adhered substrate or other non-paint material will not affect the result.

If laboratory results are reported as weight percent, the paint must be removed down to, but not including, the bare substrate. Inclusion of substrate materials in the paint sample or not removing all paint will dilute the results. For more information on how and where to collect samples, refer to Appendix 5 of the HUD Interim Guidelines (reference 1).

Any laboratory used should be accredited by the American Industrial Hygiene Association and participate in the Environmental Lead Laboratory Accreditation Program for paint samples and dust wipes for lead analysis.

Written Lead Exposure Compliance Plan

Establish and implement a written compliance program prior to the start of any operation where lead levels could exceed the Permissible Exposure Level. The written program must contain the requirements given in 29 CFR 1926.62(e)(2). Review and update the plan every six months.

Include the following in a written compliance plan:

- a description of all jobs that could cause exposure to lead;
- type of equipment used;
- materials involved;
- number of employees exposed;
- time schedule;
- methods that will be used to control lead exposure;

- arrangements made on multi-contractor sites to inform all contractors and their employees about the potential exposure to lead and their responsibilities;
- how and when the job will be inspected; and
- other relevant information.

Employee Exposure Assessment

Perform an employee exposure assessment to determine if any employee is exposed to lead at or above the action level. An employee exposure assessment requires collection of personal samples representative of a full shift, including at least one sample for each job classification. Full shift personal samples must represent the employee's regular daily exposure to lead.

OSHA allows the use of data obtained within the past 12 months in similar jobs to satisfy the requirements of the employee exposure assessment. The data used must be from similar work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, and work practices and environmental conditions used in the current operation.

Also, objective data may be used demonstrating that a particular product or material containing lead or a specific process, cannot result in employee exposure to lead above the action level. Objective data cannot be used for exposure assessment with tasks identified in 29 CFR 1926.62(d)(2).

Frequency of monitoring is determined by the following lead levels:

- $< 30 \mu\text{g}/\text{m}^3$ - no further monitoring required, except if there is a change of equipment, process, control, personnel or a new task initiated that may result in lead exposure.
- $\geq 30 \mu\text{g}/\text{m}^3$ but $< 50 \mu\text{g}/\text{m}^3$ - at least every 6 months, until two consecutive measurements, taken at least 7 days apart, are below $30 \mu\text{g}/\text{m}^3$ (monitoring can be discontinued at this point).
- $\geq 50 \mu\text{g}/\text{m}^3$ - every 3 months, until two consecutive measurements, taken at least 7 days apart, are below $50 \mu\text{g}/\text{m}^3$. If lead levels are $\geq 30 \mu\text{g}/\text{m}^3$ but $< 50 \mu\text{g}/\text{m}^3$, monitoring must be done at least every 6 months, until two consecutive measurements, taken at least 7 days apart, are below $30 \mu\text{g}/\text{m}^3$ (monitoring can be discontinued at this point).

Affected GSA employees or their designated representatives must be given an opportunity to observe any monitoring of employee exposure to lead. GSA must provide the observer necessary personal protective equipment and ensure that the observer follows all applicable safety and health procedures. The observer has the

right to an explanation of the measurement procedures, to observe all steps related to the monitoring, and a record of the results obtained or receives copies of the results when returned by the laboratory.

Notify all GSA employees in writing within 5 working days after completion of the exposure assessment. The notification must give the results that represent the employee's exposure. If the lead levels exceed the Permissible Exposure Level, the employee must be informed in the notification about the corrective action(s) that has been taken or will be taken to reduce lead exposure to below the action level.

The method of monitoring and analysis must have an accuracy (to a confidence level of 95%) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 µg/m³. Airborne lead samples should be analyzed by a laboratory qualified by the American Industrial Hygiene Association's Laboratory Accreditation Program for metals on filters.

Identified Tasks

For certain tasks, listed in 29 CFR 1926.62(d)(2), OSHA assumes that lead levels will exceed the Permissible Exposure Level. Certain protective measures must be implemented while the employee exposure assessment is performed. Lead is presumed to be present in the following tasks.

Tasks that OSHA identifies that may exceed the Permissible Exposure Level, but not more than 10 times the Permissible Exposure Level, include:

- Demolition of structures (e.g., drywall), scraping, sanding, heat gun applications, and power tool cleaning with dust collection systems (i.e., grinders, brushes, needle guns, sanders).
- Spray painting with lead paint
- Any task if the employee has reason to believe that he or she may be exposed to lead in excess of the Permissible Exposure Level and the employer has not performed an employee exposure assessment.

Tasks that OSHA identifies that may not exceed lead concentrations of 500 µg/m³ include:

- Using lead containing mortar; lead burning.
- Rivet busting, power tool cleaning without dust collection systems, cleanup activities where dry expendable abrasives are used, and abrasive blasting enclosure movement and removal.

Tasks that OSHA identifies that may exceed lead concentrations of 2,500 µg/m³ include:

- Abrasive blasting.
- Welding.
- Torch burning and cutting.

Until the employee exposure assessment is completed the following interim controls must be followed:

- Appropriate respiratory protection must be used.
- Change areas and hand washing facilities must be provided.
- Biological monitoring must be performed, to consist of blood sampling and analysis for lead and zinc protoporphyrin.
- Training of workers on lead hazards, in addition to OSHA Hazard Communication Training.

The reason OSHA gives for taking precautions before an employee exposure assessment is performed is that airborne lead samples may take up to two weeks to be analyzed. OSHA believes that workers could be overexposed to lead in that two week period. Also, many construction jobs do not last two weeks and workers would not be protected from lead exposure in these jobs.

Engineering and Work Practices

Engineering and work practice controls, including administrative controls, are the preferred methods of choice for compliance. Engineering controls include mechanical ventilation, local exhaust ventilation, shrouded tools, vacuums and wetting agents. Where feasible engineering controls and work practice controls are not sufficient, appropriate respiratory protection is required as a supplement.

Good work practices must be carried out to reduce employee exposure to lead. Recommended work practices include providing on-site washing facilities, clean segregated areas for changing clothes, daily cleanup procedures, spray misting of dry debris before cleanup, and not allowing dry sweeping and compressed air cleaning.

Containment is necessary to prevent the spread of lead dust to adjacent areas. If the abatement plan requires the breaking or disturbing of leaded surfaces, the containment steps described below should be taken. If abatement does not break or disturb lead-painted surfaces, containment measures should be used to protect surfaces, furniture, and personal possessions from damage.

Remove movable objects from the work area. Seal work area using polyethylene sheeting (at least 6 mils) on doorways and entrances. The plastic can be attached to framing if necessary. Effective barriers at openings between work and non-work areas can be created by using two layers of polyethylene sheeting (at least 6 mils).

Cover floors with at least two layers of polyethylene sheeting (at least 6 mils). The heating and air conditioning systems should be shut down and the intake and exhaust points in work area should be sealed.

Use polyethylene sheets (at least 6 mils) to cover all nonmovable objects that are not being abated, including radiators, large pieces of furniture, shelves, cabinets, built-in furniture, stoves, and floors.

Portable ventilation may be required if heat guns or chemical strippers are used. Do not allow propane heaters if the work area does not have appropriate ventilation. In a study of lead-based paint abatement jobs, NIOSH found high levels of carbon monoxide and carbon dioxide where propane heaters were used in sealed lead-based paint abatement work sites.

For more information on engineering and work practices refer to "Protecting Workers and Their Communities from Lead Hazards: A Guide for Protective Work Practices and Effective Worker Training" (reference 16).

Signs

Post warning signs in each work area where lead exposure occurs. The signs must be illuminated and cleaned as necessary so the legend is readily visible. The following wording should be on the sign (state/local requirements may require different wording):

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

Personal Protective Equipment

Determine personal protective equipment requirements in the employee exposure assessment. For most lead abatement jobs, protective coveralls and shoe covers should be worn at all times. Disposable coveralls and separate shoe covers are preferred to avoid the need for laundering. Disposable items can be either breathable or non-breathable. Non-breathable coveralls should not be used when the possibility of heat stress exists. Paper suits and shoe covers should not be used for chemical or wet operations.

Place all contaminated protective clothing which are to be cleaned, laundered, or disposed of, in a closed, labeled container in the change area. Inform the person, in writing, who cleans or launders protective clothing or equipment of the potentially harmful effects of lead exposure. Clean and dry protective clothing must be provided at least weekly, and daily to airborne lead levels exceed 200 µg/m³ as an 8-hour time-weighted average.

Use special precaution,; with chemical strippers. Workers should wear face shields, appropriate clothing and gloves. The Material Safety Data Sheet should be reviewed for recommendations on the type of clothing and gloves. An eye wash station is recommended when workers use chemical strippers. Refer to 29 CFR 1910.151 (c) and GSA Emergency Eyewash and Shower Equipment Standard Operating Procedure for more information.

The employee exposure assessment should determine the level of respiratory protection required. For most lead-based paint abatement, an air-purifying respirator with high efficiency particulate absolute (HEPA) filters can be used. This type of respirator can be used in environments where the concentration of lead in air is not in excess of 500 µg/m³. Refer to 29 CFR 1926.62(f) for guidance on respirator selection.

An employee can request a powered, air-purifying respirator in lieu of a negative-pressure respirator. A powered, air-purifying respirator cannot be used when airborne lead levels exceed 500 µg/m³.

Follow GSA and OSHA criteria for respiratory protection. This criteria includes fit-testing, training, medical surveillance, cleaning and storing requirements. Requirements can be found in the following publications:

- GSA Handbook ADM P 5940.1
- 29 CFR 1926.62(f)
- GSA Selection, Care and Use of Respiratory Protection for Maintenance Work Standard Operating Procedures

Hygiene Facilities and Practices

Personal hygiene is an important element of protecting workers from lead dust. Provide adequate washing facilities at the worksite so workers can remove lead particles that accumulate on the skin or hair.

Change areas and hand washing facilities must be provided until an employee exposure assessment is performed for identified tasks listed in 29 CFR 1926.62(d)(2). OSHA requires that change areas, showers, and eating facilities be provided when lead levels exceed the Permissible Exposure Level.

All workers exposed to lead must wash their hands and faces before eating, drinking, applying cosmetics, or using tobacco products (cigarettes, cigars, chewing tobacco, etc.). Workers must not be allowed to eat, drink or use tobacco products in the work area. Lead dust must be removed from protective work clothing or equipment when leaving the worksite by using a high efficiency particulate absolute (HEPA) vacuum, downdraft booth, or other cleaning methods that limits the spread of dust. At no time should lead be removed from protective clothing or equipment that puts lead into the work area, such as brushing, shaking, blowing, or using a regular vacuum cleaner.

Lunchroom facilities or eating areas must be provided for workers whose airborne exposure to lead is above the Permissible Exposure Level. The eating areas must be free as practical from lead contamination and readily accessible to workers. Workers shall not enter eating areas with protective work clothing or equipment unless lead dust has been removed.

Change areas must have separate storage facilities for street clothes and protective work clothing and equipment to prevent cross-contamination. Workers should change into work clothes and shoes at the worksite.

Workers must change back into their street clothes after washing or showering and before leaving the worksite. Shower facilities, where feasible, are to be provided when exposure levels exceed the Permissible Exposure Level. Where showers are not provided, hand washing facilities must be provided for workers to wash their hands and face at the end of the work-shift. These procedures are necessary to prevent the accumulation of lead dust in the workers' cars and homes and to protect family members from exposure to lead.

Clean-Up and Disposal

Daily cleanup activity is important throughout the abatement process. Early removal of dust from the work area will reduce the potential for recontamination of the property. HEPA vacuuming should be used to clean-up of floors and other surfaces whenever possible. Shovelin,], dry or wet sweeping, and brushing may only be used where HEPA vacuuming is not effective.

Compressed air shall not be used to remove lead from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air.

After the job is complete, all paint chips and debris must be removed from the work site and the area must be washed down with a cleaning solution containing Tri-Sodium Phosphate and vacuumed with a HEPA vacuum.

Special care must be taken in removing lead contaminated waste from the work site to avoid environmental contamination or injury to workers or building occupants. While in the work area, the exterior of the filled waste containers should be HEPA vacuumed and wet-wiped to remove residual contamination. If plastic bags are used, they should be bagged again as they come out of the work area.

Waste should be removed from work areas when use of the hallways and staircases is low. The path from the work area to the truck or dumpster should be planned in advance to minimize contacts with building occupants and to ensure access to freight elevators or loading docks.

Containers should be moved and packed in the truck with care. When possible, hand trucks, dollies, or pull carts should be used, along with ramps or trucks with lift gates. These procedures will help minimize container breakage.

Disposal of lead-containing paint chips, debris and waste water in accordance with Environmental Protection Agency (EPA), State and local regulations. EPA requires that representative lead abatement wastes be tested to determine if materials are regulated under the Resource Conservation and Recovery Act (RCRA), 40 CFR Part 261.

Use the Toxicity Characteristic Leaching Procedure to determine if a lead contaminated material is covered under RCRA. The Toxicity Characteristic Leaching Procedure is designed to determine the amount of lead that could be leached out if the waste came into contact with ground water at a municipal waste dump. If the Toxicity Characteristic Leaching Procedure determines that the lead concentration is 5 parts per million or greater, the waste is regulated by RCRA.

Hazardous waste must be disposed of at an EPA approved hazardous waste disposal facility. The hazardous waste disposal facility must have an EPA identification number and authorization to operate. Ensure that the hazardous waste transporter has an EPA identification number and meets the U.S. Department of Transportation requirements for shipping containers.

Refer to GSA Environmental Management Hazardous Waste Technical Guide E201, the HUD Guidelines (reference 1), and the EPA report "Applicability of RCRA Disposal Requirements to Lead-Based Paint Abatement Wastes" (reference 13) for more information on hazardous waste regulations.

Training

Train all GSA workers who are exposed to lead. This training is in addition to the hazard communication training required with OSHA's Hazard Communication Standard, 29 CFR 1926.59, and GSA Written Hazard Communication Program Standard Operation Procedure. Training should be performed by GSA industrial hygienists or contractors. Include the following information:

- The content of the lead in construction regulation, 29 CFR 1926.62.
- The specific nature of the operations which could result in exposure to lead above the action level.
- The purpose, proper selection, fitting, use, and limitations of respirators.
- The purpose and a description of the medical surveillance program.
- The contents of the written lead exposure compliance plan.
- Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician.
- The employees' right of access to their own medical files and exposure records.
- The hazards to the fetus and additional precautions for employees who are pregnant.
- Engineering controls and work practices associated with the employee's job assignment.
- The hazards of exposure to lead and symptoms of lead poisoning.
- Personal hygiene practices and the importance of following these practices.
- Unique hazards of abatement techniques, for example fumes from heat guns and skin irritation from chemical strippers.
- The signs and symptoms of heat stress if work is performed in a hot environment.

Contractors performing operations that may result in lead exposure are responsible for training their employees.

Medical Surveillance

GSA workers who are occupationally exposed on gft day to lead at or above the OSHA lead action level, must be enrolled in an initial medical surveillance program. Initial medical surveillance consists of sampling and analysis of blood for lead and zinc protoporphyrin levels.

GSA workers must be enrolled in a medical surveillance program when they are exposed to lead levels above 30 $\mu\text{g}/\text{m}^3$ for more than 30 days per year in any consecutive 12 months. Medical surveillance consists of biological monitoring of worker blood lead levels and medical examinations. Medical examinations and procedures must be performed by or under the supervision of a licensed physician. Medical surveillance provisions shall follow requirements given in Appendix C to 29 CFR 1926.62 and GSA Handbook ADM P 5940.1.

Frequency of medical examinations and consultations for employees above the lead action level are:

- At least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 months indicated a blood lead level at or above 40 micrograms per decaliter ($\mu\text{g}/\text{dl}$).
- As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice concerning the effects of current or past exposure to lead on the employee's ability to procreate a healthy child, that the employee is pregnant, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during use.
- As medically appropriate for employees either removed from exposure to lead or for a final medical determination.

The physician conducting examinations must be given the following:

- a copy of the lead in construction regulation;
- a description of the worker's job duties as those relate to lead exposure;
- the worker's exposure level or anticipated exposure level to lead and to any other toxic substances (if applicable);

- type of personal protective equipment used or to be used;
- prior blood lead determinations; and
- all prior written medical opinions.

At the employee's request, pregnancy testing or laboratory evaluation of male fertility shall be included in the medical examination.

GSA employees have the right to a second medical opinion at GSA expense. Employees must be notified that they have the right to seek a second medical opinion after the initial examination. If the two physicians have different findings and cannot resolve their findings, a third physician may be brought in to resolve any differences at GSA expense.

The physician shall give a written medical opinion to the designated GSA person and this person in turn must give a copy of the opinion to the employee. The written medical opinion shall include the following:

- The physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead.
- Any recommended special protective measures or limitations that need to be provided to the employee.
- A determination on whether an employee can wear a respirator, limitations on the employee to use a respirator, and if a powered, air-purifying respirator can be used if the employee cannot wear a negative pressure respirator.
- The results of the blood lead determinations.

GSA employees must be notified in writing of their blood lead levels within five working days after the receipt of biological monitoring results.

Workers are removed from a job whenever:

- Blood tests indicate lead levels at or above 50 µg/dl.
- Whenever an employee is exposed to lead at or above the action level and a physician determines that the employee has a medical condition which places the employee at increased risk.

A worker may only return to former job status when two consecutive blood sampling tests indicate that the employee's blood level is at or below 40 µg/dl or when a subsequent medical evaluation determines that the employee is no longer at increased risk. Any workers removed from a job must remain at the same pay and seniority for up to 18 months as long as the job lasts.

Chelation can only be done if it is medically necessary and performed under the supervision of a licensed physician in a clinical setting. Routine chelation to prevent workers from developing lead poisoning is prohibited.

Contractors performing renovation projects that require removal of lead-based paint are responsible for providing medical surveillance for their employees.

Record Keeping

Keep all employee exposure assessment records of all monitoring and other data used in conducting employee exposure assessment. Data shall include the following:

- The date(s), number, duration, location and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure.
- The type of respiratory protection used.
- Name, Social Security number and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent.
- The environmental variable that could affect the measurement of the employee exposure.

Establish and maintain medical surveillance records. Each record shall include:

- The name, Social Security number and description of the duties of the employee.
- A copy of the physician's written opinions.
- Results of any airborne exposure monitoring done on or for the employee and provided to the physician.
- Any employee medical complaints related to exposure to lead.

All employee medical records and exposure records must be maintained for at least 30 years. For more information on requirements for access to employee exposure and medical records and confidentiality refer to 29 CFR 1910.20.

Interior Abatement Strategies

The three general strategies for lead-based paint abatement are replacement, encapsulation and paint removal. When deciding which method(s) to use, the advantages, disadvantages, and costs of each strategy should be considered. Estimated average cost for each abatement method is presented in Figure 2.

The following methods of lead-based paint removal should not be used: open flame burning, dry scraping, and machine sanding without attached HEPA.

Replacement

Replacement refers to the removal of components that are covered with leadbased paint, such as windows, doors, and trim, and installing new components without lead-based paint. Replacement can be done on many exteriors and interior components, but not for most walls, ceilings, and floors. Replacement is a permanent solution and offers these advantages:

- Integrates well with renovation and modernization projects.
- May increase energy efficiency. For example, replacement windows can be more energy efficient than the original windows.
- Allows for the upgrading of components.
- No lead residue is left behind on surfaces.

The disadvantages of replacement are:

- The cost is high if replacement is done, outside the context of a large-scale rehabilitation project .
- Replacement components may be of lower quality than the original components.
- Adjacent surfaces may be damaged. For example, plaster walls can be damaged when baseboards are removed.
- Reinstallation of certain components requires skilled carpentry.
- A large volume of abatement debris may be generated.

- Nonstandard replacement parts may require special orders and additional ordering time.

Encapsulation and Enclosure

Encapsulation refers to making lead-based paint inaccessible by covering or sealing painted surfaces. Encapsulation is a good method for large surfaces such as walls, ceilings and floors. Methods also exist to encapsulate interior and exterior walls, pipes, exterior and some interior trim.

Encapsulants require periodic inspection and may require routine maintenance. Only encapsulants that have been proven to be durable, impregnable to young children, vermin-proof and fire-resistant should be used. A new coat of paint or primer, paper wall coverings, or contact paper should not be used as an encapsulant.

Gypsum dry wall and exterior siding can be used to enclose lead-based paint. Sheet rock, vinyl wall covering, and wood paneling can also be used. Tile, wood, stone and vinyl coverings can be used to seal lead paint on floors. If any of these materials are used, the appropriate fire protection characteristics should be considered.

Well-prepared surfaces are important to the durability and integrity of the encapsulating system. For example, peeling lead paint on walls should be removed by scraping before encapsulation. Misting of peeling paint before scraping to prepare for encapsulation is an inexpensive and effective method for reducing the amount of lead dust generated. Surfactants (wetting agents) may be added to the water to ease cleanup.

Another method is simply reversing wood trim. Wood trim can be turned over so that the painted surface is no longer exposed. The seams must be sealed or caulked.

Documentation of encapsulation or enclosure is important since there is the potential for exposures to underlying lead-based paint during maintenance and renovation activities. Problems may also arise during future lead paint inspection activities because encapsulated or enclosed lead-based paint can be detected by xray fluorescence analyzer.

Off-site Paint Removal

Off-site chemical removal is the stripping of lead paint from a building component at a professional paint stripper facility. Stripping is done in special chemical tanks. Some considerations are:

- The quality of the finished product is usually better than for on-site removal.
- Possible damage to components or adjacent surfaces during removal and reinstallation of the components, and to hardware left on components during removal.
- Possible swelling of some components, which may make reinstallation difficult.
- Lead residue may remain on the substrate, which makes components difficult to handle and clean.

On-site Paint Removal

All on-site paint stripping methods/materials are potentially hazardous and should be used with care. On-site removal does not require highly skilled labor, but most on-site removal methods leave lead residue on substrates which may be difficult to remove. General methods are:

- Heat Guns - Heat guns are used to soften paint on flat surfaces, which is then scrapped off. This method works best when the paint is thick and can be used on floors that are preserved for aesthetic reason. Heat guns can be very dangerous and may pose a potential fire hazard if not used carefully. Noxious organic vapors are formed from the thermal decomposition of the paint film while using heat guns. Good ventilation is required, such as open windows and exhaust fans. A respirator equipped with a combination HEPA and organic vapor cartridges should be worn. Heat guns should not be operated at more than 700°F.
- HEPA Sanders - HEPA sanders are equipped with a special, high-efficiency, vacuum that filters out lead particles. The HEPA sander is recommended only for limited surface areas. The potential for generation of lead dust increases when the sanding disk is wider than the surface being abated because the sanding shroud is not always in contact with the surface. It works best on flat surfaces such as jambs or stair risers. Other types of sanders or filters cannot be used to remove lead-based paint.
- Chemical Strippers - Chemical strippers work best on metal substrates. An exception is that caustics should not be used on aluminum. Chemical strippers may require multiple applications depending on the number of layers of paint.

Some solvent-based chemical strippers may be flammable and/or contain toxic substances. The Material Safety Data Sheet must be obtained for any stripper considered for use and reviewed. Most chemical strippers require good ventilation with open windows and exhaust fans. Removers that contain methylene chloride should not be used since this chemical is a suspect carcinogen.

Caustic chemical strippers can cause skin and eye injuries if not used properly. Review the Material Safety Data Sheet to determine what personal protective equipment is necessary. Also, the high pH of caustic strippers may require that the waste from the strippers be classified as a hazardous waste, regardless of the lead content.

The process of washing and neutralizing substrates on which caustic chemicals have been used can create large quantities of lead-bearing liquid waste. This is caused by the large amount of lead residues left on the surface by this method. Any surfaces that have been stripped with caustic chemicals or that have come into contact with this liquid waste should be cleaned by wet washing until there is no visible residue.

Exterior Abatement Strategies

Exterior abatements may generate large quantities of liquid and/or dry waste. If precautions are not taken, the lead waste can directly contaminate the outside environment. For this reason, uncontained water blasting and open abrasive blasting are unacceptable methods of abatement.

The two acceptable removal methods for exterior surfaces are contained water blasting and abrasive blasting with a vacuum arrangement. When using abrasive blasting with vacuum on exterior surfaces, ensure that the configuration of the heads on the blasting nozzle match the configuration of the substrate so the vacuum is effective in containing debris.

To contain liquid waste, polyethylene plastic sheeting (at least 6 mils thick) should be placed as close to the building foundation as possible. The edge of the sheets should extend a sufficient distance to contain the runoff and the outside edge of the sheets should be raised with two by fours, or similar means, to trap liquid waste. Seams must be sealed with tape and edges must be raised with two by four framing. Liquid waste can be pumped, vacuumed or bailed to appropriate containers for transfer to disposal facility.

To contain dry waste, polyethylene plastic sheeting (at least 6 mils thick) should be placed as close to the building foundation as possible. The edge of the sheets should extend from the foundation 3 feet per story being abated. The minimum coverage is 5 feet and the maximum coverage is 20 feet. The sheeting at the foundation and along edges and seams should be weighted down. Vertical shrouds should be erected if constant wind speed exceeds 15 mph or there is visible movement of debris beyond the ground sheeting.

The National Institute for Occupational Safety and Health (NIOSH) Evaluation of Abatement Methods

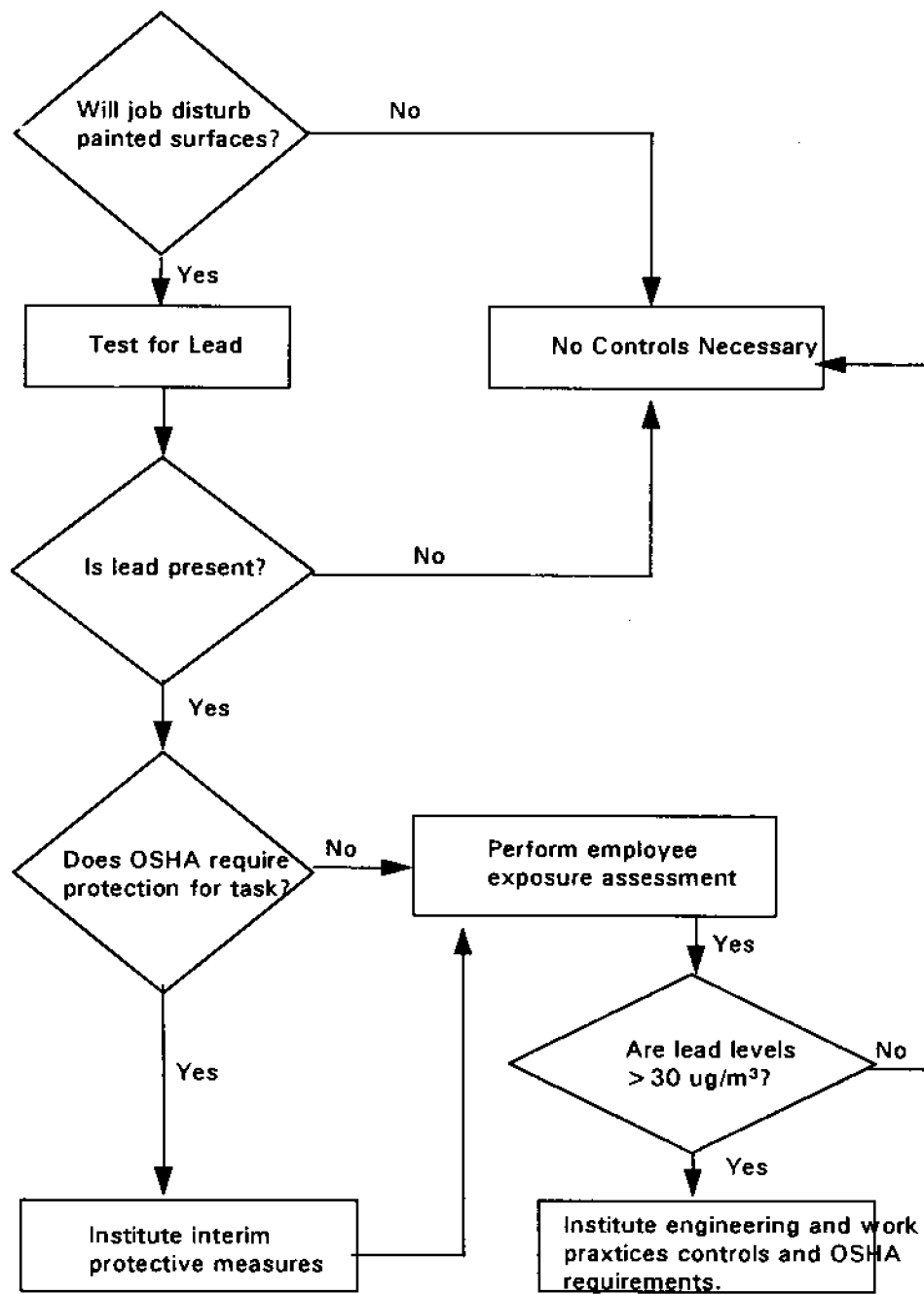
NIOSH evaluated different abatement methods during the HUD lead-based paint demonstration project. The abatement method with the highest exposure to lead was the heat gun method, with levels ranging from 0 to 286 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).

NIOSH also evaluated abrasive removal, chemical removal, encapsulation, enclosure and replacement. Overall, personal exposures to airborne lead were low during all of these methods, but the variability of exposure was high. Personal airborne lead concentrations exceeded $50 \mu\text{g}/\text{m}^3$ in almost all of the abatement methods evaluated at some time. However, less than 5 percent of the personal air samples for lead exceeded $50 \mu\text{g}/\text{m}^3$ during chemical removal, cleaning, enclosure, and replacement methods; and none of the personal air samples exceeded $50 \mu\text{g}/\text{m}^3$ for encapsulation, final cleaning and precleaning methods.

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GSA Lead Paint Program Logic
Figure 1

ESTIMATED AVERAGE COST

Encapsulation

Direct Material: \$0.18 - 0.24 per square foot

Direct Labor: \$0.40 - 3.50

Enclosure

Direct Material: \$0.68 - 1.00 per square foot

Direct Labor: \$0.50 - 5.00

Chemical

Direct Material: \$1.68 - 2.50 per square foot

Direct Labor: \$2.00 - 5.00

Hand-Scrapping

Direct Material: \$0.02 - 4.00 per square foot

Direct Labor: \$0.50 - 10.00

Replacement Trim

Direct Material: \$2.00 - 4.00 per linear foot

Direct Labor: \$1.00

Replacement Windows

Direct Material: \$105.00 - 135.00 per window

Direct Labor: \$25.00 - 30.00 per window

Replacement Doors (interior)

Direct Material: \$30.00 - 50.00 per door

Direct Labor: \$10.00 - 15.00 per door

Replacement Doors (Exterior)

Direct Material: \$90.00 - 200.00 per door

Direct Labor: \$35.00 - 40.00 per door

Source: The HUD Lead-Based Paint Abatement Demonstration Report (reference 15).

Figure 2

Technical Guide

LEAD IN DRINKING WATER AT CHILD CARE CENTERS

BACKGROUND

The General Services Administration (GSA) started testing in 1990 for lead in drinking water at all GSA child care centers. GSA tests drinking water for lead at child care center since children are sensitive to the effects of lead at low levels.

GSA tests potable water for lead in child care centers at all drinking water outlets, including water coolers. Corrective actions must be taken when lead levels are measured at or above 15 parts per billion (**ppb**).

DISCUSSION

Health Effects

Medical research shows lead to be harmful to human health even at low exposure levels. Young children, infants, and fetuses are particularly vulnerable to lead. Physical and behavioral effects of lead occur at lower exposure levels in children than in adults. A dose of lead that would have little effect on an adult can have a significant effect on a child. Low levels of lead exposure in children have been linked to damage to the central and peripheral nervous system, learning disabilities, shorter stature, impaired hearing, and impaired formation and function of blood cells.

Many children with lead poisoning have no symptoms; others have only non-specific symptoms such as headaches, stomachaches, or irritability. At its worst lead poisoning can result in kidney damage, stupor, coma, or severe brain damage.

The degree of harm depends upon the total exposure to lead from all sources, such as air, soil, dust, food (which may contain lead absorbed from air or food containers), lead-based paint, and water. Lead in drinking water can be a significant contributor to overall exposure to lead, particularly for infants whose diet consists of liquids made with water, such as baby food formula.

How Lead Gets Into Drinking Water

Lead contaminates drinking water by being present in the source water or through corrosion of lead or brass parts in a distribution/plumbing system. Most sources of drinking water used by public water systems have no lead or very low levels.

It is more common that the source of the lead is from the corrosion of lead pipes, solder, fixtures, or other parts of the plumbing system which distributes the water within the building. The corrosion of lead solder is the major cause of lead contamination.

Corrosion, a reaction between the water and the lead pipes or solder, is commonly caused by soft or acidic water. Soft water is characterized by soap lathering easily and acidic water has a low pH. If the water is not too corrosive, mineral deposits may form a coating on the inside of water pipes. The coating insulates the water from lead solder and lead levels should decrease over time. However, if the water is corrosive, the lead solder can remain a problem, regardless of the plumbing's age.

The extent of lead contamination is affected by several factors including:

- the corrosivity of the water;
- the amount of lead or brass contained in the plumbing, the faucets, or apparatus dispensing the water;
- the contact time of the water with materials containing lead;
- length and diameter of lead service lines;
- the number and age of lead soldered joints;
- whether or not electrical systems are grounded to the water pipes;
- the age of the plumbing; and
- sediment in pipes and fixture screens.

Lead contamination may not occur uniformly throughout a building. Large variations in lead concentrations may be found among individual outlets in a building because of variations in flow rates and different building materials.

If the source of the contamination is at the beginning of the distribution system, high lead levels in the drinking water may be widespread throughout the building. Lead service connectors, which are the pipes that carries water from the public water main to the building, may also be the cause of the problem. High lead levels may also be found in sections of the distribution system where the water is infrequently used or if lead solder is used for repair or installation of plumbing.

Environmental Protection Agency's Regulations

The Safe Drinking Water Act of 1974 requires the U.S. Environmental Protection Agency (EPA) to set drinking water standards to protect public health. In 1986, major amendments to this law, called the Lead Contamination Control Act, requires the use of "lead-free" pipe, solder, flux in the installation or repair of any public water system or any plumbing in a residential or non-residential facility connected to a public water system. Solder and flux are considered "lead-free" when they contain not more than 0.2 percent lead. Pipes and pipe fittings are considered "lead-free" when they contain not more than 8.0 percent lead.

The Lead Contamination Control Act also required EPA to publish a list of drinking water coolers, by brand and model, which are not lead free. The list identifies each brand and model of drinking water cooler which has a lead-lined water tank (reference 2).

On June 7, 1991, EPA issued its regulation for lead in drinking water [40 Code of Federal Regulations (CFR) 141.511. The regulation focuses on four main areas to reduce lead concentrations: corrosion control, treatment of source water, public education and replacement of lead service lines. The regulation requires all public waters systems to test their water at the consumer's tap to determine lead concentrations. Based on the results of this testing, the following actions must be taken.

- All public water systems are required to optimize corrosion control to minimize lead contamination resulting from the corrosion of plumbing materials. Public water systems that have concentrations below the EPA action level of 15 ppb for lead in more than 90% of tap samples will be considered to have optimized their corrosion control treatment. Water systems have until July 1997 to optimize their corrosion control treatment.
- If the action level is exceeded in 10% of tap samples, the public water system must monitor its source water to determine whether treatment to remove lead in source water is needed.
- If the action level is still exceeded after installation of corrosion control and/or source water treatment, the water system must eventually replace all lead service lines contributing in excess of 15 ppb of lead to drinking water.
- Whenever the action level for lead is exceeded, public water system officials must undertake a public education program to inform consumers of ways they can reduce their exposure to potentially high levels of lead in drinking water.

An important part of this regulation is that a single sample result that exceeds the action level does not require the water supplier to take action. Only when 10% of the samples exceed 15 ppb is action required.

REQUIREMENTS AND RECOMMENDATIONS

GSA's Action Level and Testing Procedures

GSA will use an action level of 15 ppb of lead in drinking water in child care centers. Water sampling and testing should be conducted in accordance with the EPA guidance manual, Lead in School Drinking Water, A Manual for School Officials to Detect, Reduce, or Eliminate Lead in School Drinking Water (reference 1).

Test all drinking water outlets, including water coolers in child care centers. A sample of 250 milliliters of water must be collected from each outlet sampled. The water sampling program should be done in two steps. The first step is to collect samples before the child care center opens and before any water is used. These samples, called the morning first-draw samples, represent the water that is consumed at the beginning of the day or after infrequent use. If these samples show no lead contamination, the water the children are drinking is probably safe.

The second step involves the collection and analysis of follow-up samples from identified outlets and, if necessary, additional samples from the interior plumbing within the building. The purpose of the follow-up samples is to pinpoint the sources of lead in the drinking water. Once the sources of contamination are known, appropriate remedial actions toward their elimination may be taken.

Also samples should be taken immediately after vacations, weekends or holidays. Do not use these samples to locate the source of lead contamination. These samples may contain higher lead levels than ones collected during the week, but are not representative of water in contact with the plumbing overnight. EPA recommends that child care centers flush drinking water outlets after weekends and vacations until these additional tests are made to determine lead levels for this period.

Analysis of Water Samples

Analysis of samples must be performed by a State-certified laboratory using EPA approved methods. To maintain quality assurance, duplicate (split) samples, blanks (distilled) water, and/or prepared samples of a known value should be taken.

Previous Testing

Water outlets that have been previously tested for lead do not have to be resampled if lead levels were below 15 ppb and testing procedures followed EPA guidance.

Initial Actions

If drinking water testing results are equal to or exceed 15 ppb, the Field Office manager, using technical assistance from the regional Safety and Environmental Management Branch/Division, should develop and carry out a plan for corrective action(s). The following actions are recommended:

1. Immediately identify and isolate contaminated drinking water source(s).
2. Provide a secondary source of drinking water (for example, an alternate drinking water source or bottled water).
3. Contact the supplier of the water and ask what they are doing to reduce lead in the water. The supplier of the water is required to have a lead reduction program if lead levels exceed 15 ppb in 90 percent of tap samples. If the local water system is taking steps to implement a corrosion control program to make the water less acid and/or soft, then lead levels are reduced throughout the system.
4. Take follow-up samples from all drinking water outlets where test results indicate lead levels over 15 ppb. Follow EPA guidance for schools (reference 1).

Interim Measures

Until permanent solutions are carried out, the following interim measures should be considered to reduce lead contamination. These interim measures are necessary until corrosion control or other treatment by the water supplier is effective or until new piping within the buildings develops a protective coating. Periodically monitor lead levels in the drinking water until levels decrease below 15 ppb and before interim measures are discontinued.

1. Clean debris from all accessible screens frequently. Sediments containing lead can be trapped on screens and can be a significant source of lead contamination. Test sediments for the presence of lead.
2. Inform clients to use only cold water for the preparation of food and beverages. Hot water dissolves lead more quickly than cold water and is likely to contain higher levels of lead. If hot water is needed, it should be drawn from the cold-water tap, then heated.
3. Purchase bottle water. Bottled water sold in interstate commerce is regulated by the Food and Drug Administration. Water that is bottled and sold within a state is under state regulation. Obtain a written statement from the bottled water distributor guaranteeing that lead levels in the water do not exceed 5 ppb.

4. Flush the water system before the child care center opens in the morning. Flushing may not be practical in large buildings or when the lead levels return to their original levels within four hours of flushing. Refer to EPA guidance for schools for details on how to flush a water system.

5. Determine if copper pipes installed after 1986 are joined with lead solder. This practice was banned in 1986. Lead solder looks dull gray, and when scratched with a key looks shiny. If lead solder was used after 1986, notify the plumber who did the work and request that he or she replace the lead solder with lead-free solder. In addition, notify the state water department who is responsible for enforcing the Safe Drinking Water Act about the violation.

Permanent Solutions

Several actions can be taken to reduce permanently or eliminate the sources of lead in the building's plumbing system. Field Office managers must examine these options and make their own decision based on such factors as cost, availability of water, and manpower requirements.

Permanent solutions include the following:

1. Install commercially available corrosion control devices for individual buildings, such as calcite filters, soda ash or phosphate solution tank and feeder units. When selecting a device consider the performance record and the corrosion-reduction capabilities. Contact the State department of health or environment for assistance and advice about selecting and installing point-of-entry devices. Do not purchase carbon, sand, cartridge filters or water softeners since these devices are not effective in removing lead from water.
2. Point-of-use treatment devices, such as reverse osmosis devices and distillation units, can reduce lead levels at the tap. These devices should only be installed at the tap since they also soften water. Units are expensive and may be either purchased or leased. Problems with a point-of-use device are that effectiveness varies, increased water usage, may be subjected to vandalism and a maintenance contract may be required for regular upkeep. Before purchasing a device, check with the State department of health or environment or the National Sanitation Foundation (NSF). NSF has a testing program to evaluate the performance of point-of-use treatment devices. NSF's address and telephone number are:

NSF, 3475 Plymouth Road, P. O. Box 1469, Ann Arbor, MI 48106, (313) 769-8010.

3. Remove existing wires grounded to the water pipes by a qualified electrician and install an alternative grounding system. Electrical current accelerates the corrosion of lead in the piping materials. Assure that the state or local building codes allow removal of electrical grounding from water pipes. In some instances, removal of grounding from water pipes may create a shock hazard unless an acceptable alternative ground is provided.
4. Replace outlets if the sources of lead contamination are localized and limited to a few outlets.
5. Install a time-operated solenoid valve and set it to automatically flush the main pipes of the system, known also as headers. Drinking water fountains cannot be flushed automatically, but may be manually flushed by maintenance personnel.
6. Replace the portion of lead service lines under the jurisdiction of the building if the water supplier is replacing its lead service lines. The supplier of the water is required to replace lead service lines if corrosion control and/or source water treatment are not effective. The water supplier will only pay to replace the portion of the service line under its control, but the supplier must offer to replace the building owner's portion of the line at the building owner expense.
7. Modify the plumbing system so water supplied for drinking or cooking bypasses sources of lead contamination.

Notification and Reporting

The regions must forward the results of water testing for lead in child care centers to the building manager or occupant agency liaison. The building manager or occupant agency liaison must inform child care center employees and the parents or guardians of children that attend the child care centers of the results and response actions that will be taken if lead levels exceed 15 ppb.

Central Office, Environmental Management Branch, tracks all child care centers where lead levels have not been reduced below the action level on a quarterly basis. Regions are required to submit their most up-to-date list of child care centers where lead levels have exceeded the action level and summary information at the end of each quarter.

Enter response/abatement actions into the Safety and Environmental Management System (SAFE) and into the Repair and Alterations Computerized Automated Tracking System, if it is out of the funding authority of the Facility Manager.

REFERENCES

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Technical Guide

POLYCHLORINATED BIPHENYLS (PCBS)

BACKGROUND

On October 1, 1990, GSA successfully met the federally mandated deadline for removal or retrofill of transformers containing PCBS.

Small capacitors containing PCBS, including light ballasts, are still in use. These items are to be disposed of in accordance with hazardous waste regulations.

DISCUSSION

PCBs are included as a "hazardous substance" under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The disposal of more than one pound of PCBs (approximately 25 ballasts) in a sanitary landfill constitutes a PCB release under CERCLA. This would immediately trigger a notification and cleanup requirement.

The Resource Conservation and Recovery Act (RCRA) has banned these chemicals, from being disposed of in landfills.

As of this writing, the Environmental Protection Agency (EPA) is considering revisions to the Toxic Substances Control Act (TSCA) regulations for PCBS. Among other changes, these could modify the disposal requirements for ballasts, and provide for operations and maintenance (O&M) programs, including surface and air monitoring of PCBs installed before TSCA was enacted which are still in use, and removal of those substances if releases exceed specified thresholds.

GSA REQUIREMENTS/RECOMMENDATIONS

Two options are available regarding PCB small capacitor disposal:

1. Incineration at a permitted facility, or
2. Capacitor removal/incineration (at a permitted facility) and recycling (of remaining material).

The following actions are required for handling PCB-generated hazardous waste:

1. Obtain the State assigned hazardous waste notification number.
2. Prepare hazardous waste manifest prior to transport.
3. Ensure that materials are transported by a permitted hauler.
4. Obtain certificate of destruction and forward copy to the Safety and Environmental Management staff.
5. Certificates of destruction are to be maintained for a minimum of 3 years.
6. Contract with recycling/incineration firm (optional).

Technical Guide

RADON IN AIR

BACKGROUND

The General Services Administration's (GSA's) Radon Program consists of testing, notification of agencies of radon testing results, mitigation of all spaces with readings at or above the GSA action level, and retesting of these areas. It includes all GSA-owned, -leased, and delegated buildings or space. The program is ongoing since new buildings and spaces are continually coming into the inventory.

GSA Business Practice

GSA tests radon in air based on a condition of occupancy. Testing for radon in GSA-owned, -leased and -delegated space must be done for at least 90 days using alpha track detectors (ATDS) or electret ion chambers (EiCs). Testing is to be performed in areas that are in ground contact and are occupiable or routinely visited.

Where GSA does not control space in ground contact, test the lowest floor of Government occupancy up to and including the second floor above grade (space on the third or higher floor above grade need not be tested). In leased space of 10,000 square feet or above (20,000 square feet of warehouse space, lessors test and certify radon levels or, if the lease does not require testing by the lessor, GSA tests. In leased space of less than 10,000 square feet (20,000 square feet of warehouse space), GSA tests radon levels.

When radon levels are at or above 4 picocuries per liter (4 pCi/L), mitigation is promptly performed by GSA for GSA-owned space, or the lessor for leased space. After, mitigation retest the area for at least 90 days with alpha track detectors or electret ion chambers. Continue the mitigation-and retest cycle until levels are less than 4 pCi/L. This is typically a one-time cycle; however, retesting for radon is required when structural or operational changes occur which may affect radon levels.

GSA established an action level of 4 pCi/L to begin mitigation. The action level is based on the EPA guideline for radon in residential housing, and EPA approval of GSA's program under the Indoor Radon Abatement Act of 1988. Similarly, GSA

established an occupancy level of 200 pCi/L, based on the EPA's occupancy guideline for radon in residential housing.

DISCUSSION

Source of Radon

Radon gas is formed from the radioactive decay of natural deposits of uranium 238 in the ground. Uranium 238 decays into radium 226 and radon 222. When radon decays it produces radioactive particles (radon progeny) of polonium, bismuth and lead.

Radon gas seeps into buildings located near or on soil containing uranium ores. The gas travels through the soil and enters the lower building levels through cracks and holes in the basement/foundation walls, floor, drains, or sump pump openings. The average background radon concentration is 0.1 pCi/L. Typical indoor measurements average 1 to 2 pCi/L where uranium is present in the soil.

Health Effects

The primary health risk from exposure to radon is lung cancer. The radon progeny, rather than radon gas, causes the damage to the lungs when breathed in. Radon progeny attach themselves to larger airborne particles, such as dust particles, which can be breathed in and deposited in the lungs. The trapped radon progeny gives off alpha radiation and can damage the surrounding lung tissue. The damage from alpha radiation can produce lung cancer.

The risk of developing lung cancer is dependent upon the concentration of radon and length of exposure. Smoking and exposure to radon also increases the risk of developing lung cancer. Smokers exposed to radon may have up to ten times the risk of developing lung cancer as never-smokers exposed to the same radon levels. The Environmental Protection Agency (EPA) estimates that between 5,000 and 14,000 lung cancer deaths a year in the United States may be attributed to radon.

Federal Regulations for Radon

There are no Federal regulations for radon specific to the working environment. EPA has developed guidelines for private residences and recommends that mitigation actions be taken to reduce radon levels to below 4 pCi/L.

RECOMMENDATIONS

GSA-Owned and Delegated Buildings

GSA's measures radon in air in GSA-owned and delegated buildings on a one-time basis. Test buildings within 30 days of entering the inventory. Retest for radon when structural or operational changes occur which may affect radon levels.

Implement this program using Safety and Environmental Management personnel, their designee, or qualified contractors) who are familiar with building construction and operations.

Testing Requirements

Perform radon measurements for a minimum of 90 days using alpha track detectors (ATDS) or electret ion chambers (EICs). Analysis of measuring devices must be done by a laboratory that successfully participates in the EPA-sponsored Radon Measurement Proficiency Program.

Obtain measuring devices directly from a supplier of EPA-approved detectors. Figure 1 provides information on placement of detectors and quantities needed. Review the building profile and floor plans to assist in determining where to place measuring devices.

Knowledge of the building profile (structure, mechanical areas, utilities) will assist in identifying the sampling areas. A review of below grade floor plans can be used in determining detector locations.

Place ATDs or EiCs in areas which are on floors directly in ground contact, or over/next to a crawl space or void in ground contact. These areas include:

- 1 . Permanently occupied areas, such as office space or break areas.
2. Areas that are occupiable.
3. Areas routinely visited by employees of the building, such as mechanical areas, storage areas, or work shops. A routinely visited area can be defined as an area that employees) visit for more than one hour a day.

Place a sufficient number of detectors throughout the area of the building in ground contact to assure each detector covers no more than 2,000 square feet. Place detectors in this situation close to suspected sources of radon entry into the building.

There is some concern that children may be more sensitive to radon than adults. For this reason all child care centers should be tested even if they are not located on ground level.

Locate ATDs or EICs in the following places:

1. Enclosed areas/rooms expected to have the lowest ventilation rates, such as interior rooms with no windows and tight doors. Do not place detectors directly in areas/rooms where ventilation systems mix outdoor and indoor air, where there is high air circulation or exhaust fans except as outlined in paragraph 4 below.
2. Close to, but not directly in inaccessible areas such as closets, sumps, crawl spaces, or nooks within the foundation.
3. Areas with cracks in walls or floors, where there are penetrations of walls or floors (for example pipes, electrical cables, etc.), areas with outside corners, and where construction or expansion joints are present.
4. Mixing chambers in ground contact where the return air from the ground level mixes with outside air before recirculation to other areas of the building. The purpose for placing this detector inside mixing chambers is to determine if radon gas is being circulated to floors not in ground contact.

Complete a radon detector location questionnaire for each radon detector activated (an example is given in Figure 2). Collect and ship the detectors upon completion of the measuring period to an EPA approved laboratory for analysis.

Quality Assurance Program

Regions should develop a quality assurance program to assure that data are scientifically sound, precise, and accurate. Include duplicate and control detectors for analysis.

Duplicate measurements provide a check on the quality of the measurement result, and allows an estimate of the relative precision or coefficient of variation. Side-by-side duplicate measurements should be taken for at least ten percent of the samples, or 50 each month, whichever is smaller.

Use control samples, or blanks to measure the background of a statistically significant number of unexposed detectors from each batch or lot to establish the

laboratory background for the batch and the entire measurement system. This laboratory blank value is routinely subtracted by the laboratory from the results.

Control samples should be equal to approximately five percent of the detectors deployed, or 25 each month, whichever is smaller. These controls should be set aside from each detector shipment, kept sealed in a low radon environment, labeled in the same manner as the field samples to prevent special processing, and returned to the analysis laboratory along with each shipment.

Response Actions

For both GSA-owned and leased buildings, promptly initiate response actions in buildings7- or areas where radon measurements are at or above 4 pCiLL in air, and retest after completing the response action. The time frame for response actions are:

- Less than 20 pCi/L: Correct within 3 years.
- Between 20 and 200 pCi/L: Correct within 6 months.
- Above 200 pCi/L: Restrict the use of the area immediately -and provide comparable temporary space for the employees.

A variety of techniques exists for reducing indoor radon levels. The site and structural conditions play an important role in determining the success or failure of radon mitigation techniques. Use the following approaches to mitigate radon:

- Sealing off Entry Routes - Place barriers between the source material and occupiable space to reduce gas entry into a building. This can include covering exposed earth with concrete or a gas-proof liner, sealing cracks and holes in concrete walls and floors, covering sumps and placing a removable plug in untapped floor drains.
- Pressurization (positive pressure) - Increase ventilation in affected areas to decrease radon levels and to reduce the "stack effect" in buildings. The "stack effect" is a phenomenon in building structures which causes rising air currents to create a negative pressure in the lower sections of the building and can result in drawing more radon into the building.
- Soil Ventilation - Draw radon gas away from a building's foundation before entering the building using soil ventilation. Active ventilation techniques include hollow block wall ventilation, sub-slab ventilation using drain tile suction, and wall and sub-slab ventilation using selected

suction points. Care must be taken when installing these methods to seal major openings that could reduce suction.

Follow-up Measurements

Conduct follow-up radon measurements after the completion of a response action to determine the adequacy of the response action. Use a minimum 90 day measurement with ATDs or EICs except when time is of the essence. If time is of the essence, ATDs or EICs may be used for a minimum period of 2 to 4 weeks or charcoal canisters or EICs (using short term electrets) for 2 to 3 days. If measurements are taken for less than 90 days, a follow-up measurement for a minimum of 90 days with ATDs or EICs must be done.

Leased Buildings/Space

GSA's radon provisions are included in new lease agreements for leased space of 10,000 square feet or more of general purpose office space and 20,000 square feet or more of warehouse space. -The lessor tests for radon that 12ortion of si2ace grogosed for lease in ground contact or closest to the ground ul2 to and including the second floor above grade (space on the third or higher floor above -grade need not be tested), certifies the results, and promptly carries out a mitigation program (includi a follow-up measurements) for any radon level which equals or exceeds the EPA action level to below that level. The lessor pays for mitigation and associated costs (e.g., delay of occupancy, tenant relocation and reoccupancy, and follow-up measurement). Refer to the current Solicitation for Offers for detailed testing, mitigation and certification requirements.

If time is of the essence in awarding a lease, ATDs or EICs may be used for a minimum period of 2 to 4 weeks or charcoal canisters or EICs (using short term electrets) for 2 to 3 days. If measurements are taken for less than 90 days, a follow-up measurement for a minimum of 90 days with ATDs or EICs must be done.

Several types of leases do not contain GSA's Radon Program requirements: new leases that are less than 10,000 square feet for general purpose office space; new leases that are less than 20,000 square feet of warehouse space; and some lease agreements that were executed prior to the initiation of GSA's Radon Program.

GSA regions must test in leased spaces if the lease -agreements do not contain the GSA radon program requirements. This testing must be performed by GSA Safety and Environmental Management personnel or contractors following the GSA testing protocol. Testing should be initiated within 30 days of the leased space entering the inventory and should follow all program requirements given in this technical guide.

Encourage lessors to take mitigation actions if radon levels are at or exceed 4 pCi/L if they are not required to do so under the lease. If lessors refuse to mitigate their buildings, then as a last resort, regions will have to pay for mitigation actions in GSA leased space. Funds for testing and corrective actions under \$10,000 can be taken from B/A 61; funds for corrective action over \$10,000 from B/A 54.

Notification and Reporting

The regions must forward the results of the radon measurements taken in GSA-owned, -leased or -delegated buildings/space to the Property Management Center Customer Service Representative or occupant agency liaison. The Customer Service Representative or occupant agency liaison must inform building occupants of the results and response actions that will be taken if radon levels exceed 4 pCi/L.

Results from occupant agency measurements should be presented to GSA in according to the requirements outlined in the Federal Property Management Regulations. Provide information to occupant agency liaisons in GSA-controlled space on radon measurements, proposed response actions and post response action measurement results. The occupant agency liaison will then be responsible for notifying their employees.

Regions enter response/abatement actions into the Safety and Environmental Management System (SAFE) and into the Repair and Alterations Computerized Automated Tracking System (RACATS), if it is out of the funding authority of the Property Management Center.

REFERENCES

U.S. Environmental Protection Agency. Radon Reference Manual. EPA 520/1-87-20. Office of Radiation Programs, Washington, DC, 1987.

U.S. Environmental Protection Agency. Interim Protocols for Screening and Followup Radon and Radon Decay Product Measurements, EPA 520/1-86-014. Office of Radiation Programs, Washington, DC 1987.

U.S. Environmental Protection Agency. A Citizen's Guide to Radon: What It Is and What to do About It, EPA-86-004.

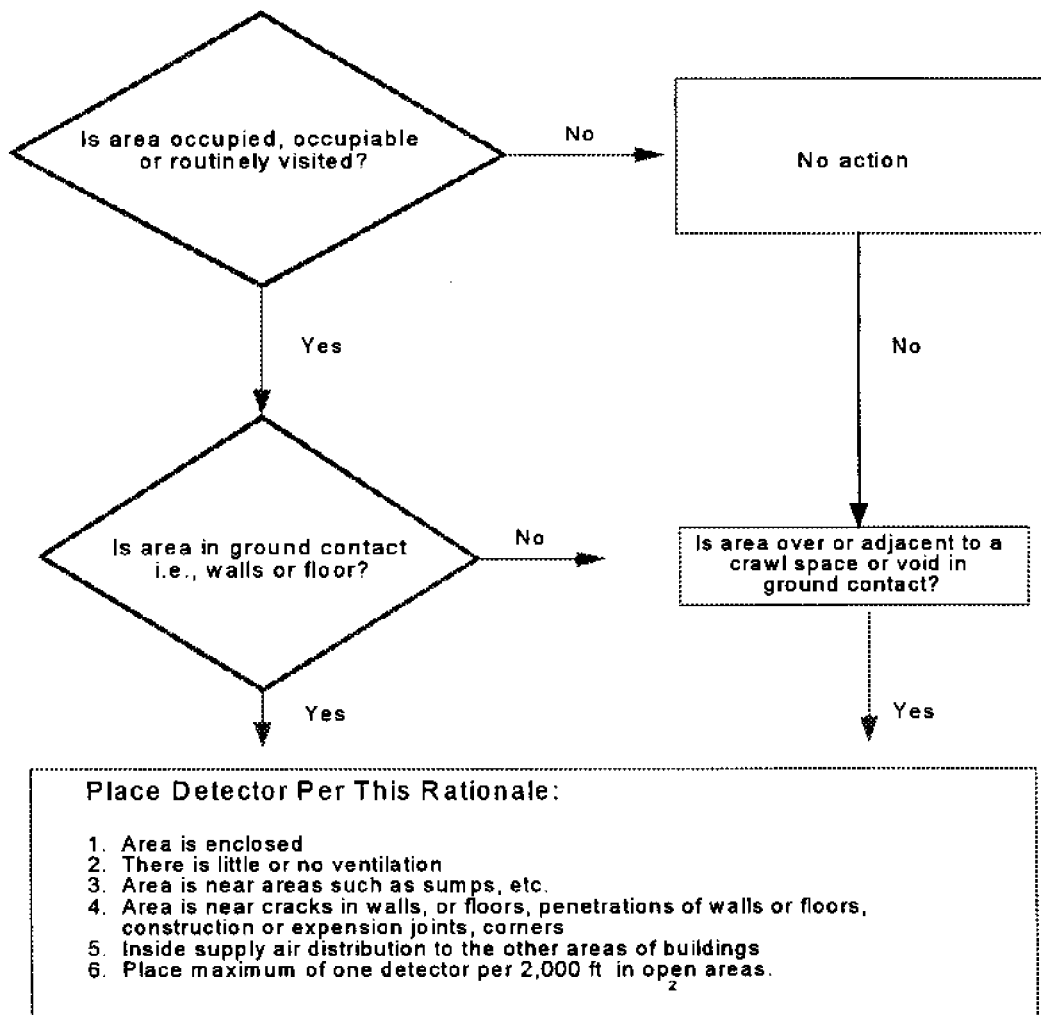


Figure 1
Placement of Radon Detectors

**RADON DETECTOR
LOCATION QUESTIONNAIRE**

1. Name and Telephone Number of the Person Placing Detector:

-
2. Check Type of Detector Used:

Alpha Track:_____ Electret Ion Chamber:_____ Charcoal-Canister:_____

3. Detector Number (number should be a combination of the GSA building number and the detector number, i.e. MA01325ZZ-01): _____

4. Date and Time Detector was Activated: _____

5. Specific Location of Detector:

6. Date and Time Detector was Deactivated:

7. Name and Telephone Number of the Person Recovering Detector:

8. Additional Comments:

Figure 2

Technical Guide

RADON IN WATER

BACKGROUND

The General Services Administration's (GSA's) Radon Program includes testing water for radon at sites using a non-public water source, notification of agencies of testing results, mitigation of all spaces with readings at or above the GSA action level, and retesting of these sites. It involves testing all GSA-owned buildings, leased space and delegated buildings or space. The program is ongoing since new sites are continually coming into the inventory.

Business Practice

GSA tests non-public water sources for radon according to GSA and Environmental Protection Agency (EPA) procedural guidance. Mitigate when radon levels are at or above the GSA action level of 500 picocuries per liter (pCi/L). After mitigation, retest the water supply. Continue the mitigation and retesting cycle until levels are less than 500 pCi/L. When radon levels are at or above 300 pCi/L maintain records for possible future action.

DISCUSSION

Source of Radon in Water

About one-half of the U.S. population relies on underground sources of water, called ground water. Ground water flows through porous soil and small spaces between rocks. Radon is formed from natural deposits of uranium and is soluble in water.

The level of radon in ground water depends upon the amount of uranium in the ground and the flow rate of the water. The level of radon in ground water is usually less than 1,000 pCi/L; however, levels have been detected where concentration exceed 1,000,000 pCi/L. Radon is usually not a problem in surface water or water supplied by a municipal water system.

Most of the radon will be released from water when the water is exposed to air. Usually there will be an increase of about 1 pCi/L in the air inside a building for every 10,000 pCi/L of radon in the water.

The water supply is normally not the sole contributor to indoor radon. Usually only 2 to 5 percent of the radon found in a building comes from the water. Exceptions do occur to this rule, especially in some areas of the northeast and west. High concentrations of radon in water in these areas may become a significant factor in total indoor radon levels.

Health Effects

The primary health risk posed by radon in water is lung cancer. For lung cancer to occur, radon must be breathed in. This occurs when radon is released to the air during water use. Once radon is breathed in, it gives off alpha radiation which can damage the surrounding lung tissue. The damage from alpha radiation can produce lung cancer.

The risk of developing lung cancer is dependent upon the concentration of radon and length of exposure. Smoking and exposure to radon also increases the risk of developing lung cancer. Smokers exposed to radon may have up to ten times the risk of developing lung cancer as never-smokers exposed to the same radon levels. EPA estimates that between 5,000 and 14,000 lung cancer deaths a year in the United States may be attributed to radon.

Drinking water contaminated with radon may add some minor risk of developing stomach or other internal organ cancer. This risk is small compared to the risks from breathing indoor air containing radon.

EPA estimates that about 200 cancer fatalities per year are attributable to radon in drinking water, 80% or 160 of which are estimated to be due to lung cancer. Of these, approximately 85% may involve synergism with smoking.

Federal Regulations

There is presently no Federal drinking water standard for radon in water. When GSA began its radon in water program in 1989, EPA was considering a Maximum Contaminant Level (MCL) in the range of 200 to 2000 pCi/L. In discussions with EPA, a temporary action level of 2,000 pCi/L was chosen to begin corrective actions.

In the July 18, 1991 Federal Register, the EPA published its proposed rule for radionuclides, stating:

EPA considered proposing radon MCLs in the range of 200 to 2000 pCi/L. However, 2000 pCi/L represents an estimated 10⁻³ risk, and this alternative was rejected as inconsistent with the Safe Drinking Water Act and EPA risk management policy. EPA therefore concentrated much of its effort on evaluating MCL alternative in the range of 200 to 500 pCi/L. Based on considerations of available treatment technologies, cost, risk, analytic capabilities and implementation concerns, EPA determined that 300 pCi/L is the lowest feasible level at which radon can be regulated and proposes to set the MCL at this level.

EPA estimates that by regulating radon in water in the range of 200 to 500 pCi/L would prevent 57-100 cancer cases annually.

PROCEDURES

Testing

GSA's practice is to test for radon in water according to EPA's Radon in Water Sampling Program Manual (reference 3). Instructions from this manual are given below. Obtain water sampling kits directly from approved laboratories.

Collection procedures are:

1. Take two water samples from the same location inside the building, and as near to the non-public water source as is practical.
2. Attach the sampling funnel and tube to a faucet with either the standard faucet fitting or adapter.
3. Slowly turn on the water and allow a steady stream to flow out of the funnel for approximately 2 minutes. This purges the tube and assures a fresh sample.
4. Reduce the flow of water and invert the funnel. Adjust the flow to a level that does not cause turbulence in the pool of water contained in the funnel. Allow excess water to spill over one edge of the funnel.
5. Examine the hose connection and tubing for air bubbles or pockets. If these are visible, raise or lower the funnel until they are removed.
6. Place the tip of the hypodermic needle approximately 3 centimeters (cm) under the surface of the water in the funnel and withdraw a few ml of water and eject this water. Using this procedure, rinse the syringe and hypodermic needle two or three times.

7. Again, place the tip of the needle approximately 3 cm below the surface of the water and withdraw 12 to 15 ml. **NOTE: Pull water into the syringe slowly to avoid extreme turbulence and collection of air bubbles. If large air bubbles are noticed in the syringe, the sample should be ejected and redrawn.**
8. Invert the syringe and slowly eject any small air bubbles and extra water. Retain precisely 10 ml of water in the syringe.
9. Remove the cap from a vial and carefully place the tip of the needle into the bottom of the liquid scintillation solution. Slowly eject the water from the syringe into the vial. **NOTE: Inject the water under the liquid scintillation solution to prevent loss of radon from the sample. If the water is forced out of the syringe with much pressure, it will cause turbulence in the solution and could result in loss of radon.**
10. Carefully withdraw the hypodermic needle from the vial and replace the cap. Tightly secure the cap to prevent leakage.
11. Repeat the previous steps to obtain two separate samples from each source.
12. Complete a sample data form to include date, time, location and description of the source.

Water analysis must be performed by an EPA or state approved laboratory. The analysis of water samples for radon must be performed using the analytical procedures described in EPA's "Two Test Procedures for Radon in Drinking Water" (reference 1). Due to the analytical sensitivity based upon the short half life of radon in water (3.68 days), arrangements for analysis are to be made in advance with a laboratory.

Response Actions

If GSA detects a radon-in-water level at or above the GSA action level, the Property Management Center's Customer Service Representative promptly provides water below the GSA action level (such as bottled water), and either mitigates the nonpublic water source so that the the occupants' drinking water is below the GSA action level, or provides a permanent public water source.

The two basic types of treatments for removing radon from water are aeration and granular activated carbon (GAC). The advantages and disadvantages to both methods are discussed below.

Aeration, also known as air stripping, uses forced air bubblers to remove radon gas from water. Aeration techniques for removal of radon from drinking water include active processes such as diffuse aeration, packed tower aeration, slat tray aeration and free fall, with or without spray aerators, and passive processes such as free-standing, open air storage of water for reduction of radon. The aeration technique chosen depends upon source water quality, institutional or personnel constraints, and site-specific design factors.

The advantages of aeration are that it removes other volatile contaminants and the radon removal efficiencies of 90 to 99.9 percent. The disadvantages are that it requires repressurization of the water supply, it is mechanically more complex than GAC, and radon must be safely ventilated outside.

GAC traps radon as the water passes through a tank containing activated carbon. There is considerable controversy concerning the buildup of low level radiation on the GAC bed. The radiation is caused by accumulated radon, which decays and produces gamma radiation. The maximum gamma activity occurs on the tank surface at the top of the bed. The gamma reading falls off significantly with distance, but even at several feet, the levels are significantly greater than background for wells containing more than 20,000 pCi/L of radon. Shielding may be required to reduce exposure to gamma radiation.

Proper disposal of used GAC beds is also of concern. Radium, uranium, and polonium-210 are decay products of radon and accumulation can be significant in GAC beds treating high concentrations of radon. In some States, used GAC beds are classified as low-level radioactive waste.

The advantages of GAC are that operation is simple, improved taste and odor of the water and radon removal efficiencies of 75 to 99 percent. The disadvantages are that GAC units can become fouled with common water contaminants, a real and perceived radiation hazard, the added expense of shielding if radon levels are high, and high disposal costs if the used GAC beds are classified as low-level radioactive waste.

Follow-up Actions

Following the completion of a response action, conduct follow-up radon measurements to determine the adequacy of the response action using sampling techniques given above.

GSA Leased Buildings/Space

GSA's radon in water requirements are included in new lease agreements for leased space of 10,000 square feet or more of general purpose office (20,000 square feet or more of warehouse space). If the Government or the Lessor detects a radon-in-water level at or above the GSA action level in any sample, the Lessor promptly provides acceptable water, mitigates the non-public water source, certifies the results, and revises the mitigation program when building conditions or operations which would or do affect the program or the radon level change. Refer to the current Solicitation for Offers for detailed testing and certification requirements.

The following types of leases do not contain GSA's radon in water requirements: new leases that are less than 10,000 square feet for general purpose office space; new leases that are less than 20,000 square feet of warehouse space; and most lease agreements that were executed prior to the initiation of GSA's Radon Program.

GSA regions test in leased spaces if the lease agreements do not contain the GSA radon program requirements. This testing must be performed by GSA Safety and Environmental Management personnel or contractors following GSA testing protocol. Testing should be initiated within 30 days of the leased space entering the inventory and should follow all program requirements given in this technical guide.

Encourage lessors to take mitigation actions if radon levels are at or exceed 500 pCi/L if they are not required to do so under the lease. If lessors refuse to mitigate their buildings, then as a last resort, regions will have to pay for mitigation actions in GSA leased space. Funds for testing and corrective actions under \$10,000 can be taken from B/A 61; funds for corrective action over \$10,000 from B/A 54.

Reporting/Notification

The regions must forward the results of the radon measurements taken in GSA-owned, leased or delegated buildings to the Property Management Center Customer Service Representative or occupant agency liaison. The Customer Service Representative or occupant agency liaison must inform building occupants of the results and response actions that will be taken if radon levels exceed the GSA action level of 500 pCi/L.

Results from occupant agency measurements shall be presented to GSA according to the requirements outlined in the Federal Property Management Regulations. Occupant agency liaisons in GSA-controlled space will be provided information on radon measurements, proposed response actions, and post-response action measurement results. The occupant agency liaison will then be responsible for notifying their employees.

Enter response/abatement actions into the Safety Environmental Management System (SAFE) and into the Repair and Alterations Computerized Automated Tracking System (RACATS), if it is beyond the funding authority of the Facility Manager.

REFERENCES

U.S. Environmental Protection Agency. Two Test Procedures for Radon in Drinking Water, EPA/600/2-87/082. Environmental Monitoring Systems Laboratory, Las Vegas, NV, 1989.

Federal Register. Vol. 56, No. 138. National Primary Drinking Water Regulations; Radionuclides; Proposed Rule (July 18, 1991), pp. 33050-33127.

U.S. Environmental Protection Agency. Memorandum: National Inorganics and Radionuclide Survey (NIRS) Sampling Method, May 11, 1989. Water Technology Branch, Cincinnati, OH.

U.S. Environmental Protection Agency. Reducing Radon in Structures Manual. Office of Radiation Programs, Washington, DC, 1989.

Technical Guide

SAFETY AND ENVIRONMENTAL ABATEMENT PROJECT COMMUNICATION

BACKGROUND

GSA promotes openness in communication with customers, regulatory agencies, the public, and other parties during all stages of asbestos-related repair, renovation and abatement projects. Figure 1, Safety and Environmental Abatement Communication Program, summarizes communications elements at each stage.

DISCUSSION

GSA's safety and environmental abatement communication program complies with federal regulations and guidance, including the:

General Services Administration's Federal Property Management Regulations.

Occupational Safety and Health Administration's standards for construction and hazard communication.

Environmental Protection Agency's Resource Conservation and Recovery Act and Comprehensive Environmental Response, Compensation, and Liability Act regulations.

Department of Transportation Hazardous Material Regulations.

Applicable State and local environmental regulations.

REQUIREMENTS AND RECOMMENDATIONS

GSA staff at the Central, regional and property management centers develop and implement safety and environmental abatement communication program elements under their purview.

Public Buildings Service

The Commissioner, Public Buildings Service, and Assistant Commissioner for Property Management issue business practices and implementing guidance on safety and

environmental abatement communication. The Assistant Commissioner assesses regional program implementation through ongoing performance evaluations.

Regional Offices

The Regional Administrator develops and implements the overall program in the region. The Assistant Regional Administrator for Public Buildings Service implements the program in regional facilities.

Property Management Centers

The Customer Service Representative of the Property Management Center is responsible for the implementation of the communication program.

Customer Agencies

Customer agencies in GSA-controlled space are responsible for the actions of their employees and contractors, for complying with the GSA safety and environmental abatement communication program for their space. Customer agencies are encouraged to communicate about safety and health issues with their employees in the manner provided in their operational and personnel regulations.

In delegated space, the delegated agency's facility manager implements the safety and environmental abatement communication program for the space.

REFERENCES

U.S. Environmental Protection Agency. Resource Conservation and Recovery Act regulations. 40 CFR 260-299.

U.S. Environmental Protection Agency. Comprehensive Environmental Response, Compensation and Liability Act regulations. 40 CFR 300-399.

U.S. Environmental Protection Agency. Asbestos Hazard Emergency Response Act (AHERA) regulations. 40 CFR 763.80-99.

U.S. General Services Administration. Federal Property Management Regulations. 41 CFR 101. (In particular, parts 101-20.002-1 (k) and 101-20.101 (d).)

U.S. Occupational Safety and Health Administration. Asbestos construction standard. 29 CFR 1926.58. (Includes specific hazard communication requirements.)

U.S. Occupational Safety and Health Administration. Hazard communication standard for construction. 29 CFR 1926.59.

U.S. Department of Transportation. Hazardous Material Regulations. 49 CFR 171-180.

Safety and Environmental Abatement Project Communication Program

1. **Practice.** The General Services Administration (GSA) promotes openness in communication with customers, regulatory agencies, the public, and other parties during all stages of safety and environmental abatement-related repair, renovation and abatement projects. Figure 1, Overview of Safety and Environmental Abatement Communication Program, summarizes communications elements at each stage,

2. **Project Stages.** Regional and property management center staff involved with a project should identify major project stages requiring significant communication efforts, whether the project is funded by prospectus, the region, or the property management center. Project stages include some or all of the following:

- a. Building safety and health survey and assessment (par. 5).
- b. Building Engineering Report (BER) (par. 6).
- c. Prospectus Development Study (PDS) (par. 7).
- d. Project development and funding (par. 8).
- e. Project design (par. 9).
- f. Major project design evolution and revisions (par. 10).
- g. Construction (par. 11).

(Note: Par. 12 contains a list of abbreviations.)

3. **Communication elements.** At each project stage, the regional and property management center staff involved should identify major elements of the communication process appropriate for that stage. This document contains a detailed set of communication elements to assist the regions technically in implementing communication programs. Building managers lead the project communications activities, and are supported by property management center and regional staff (Safety and Environmental Management, Design and Construction, etc.) as required for the performance of the project. Some elements may not be required for all projects. Similarly, the region may wish to tailor the elements in this document or develop alternate communication elements to meet specific project conditions.

The main safety and environmental abatement project communication elements are described in the subheadings for each stage-.

- a.** Information topics.
- b.** Primary audiences.
- c.** Information presentation and question response.
- d.** Presentation methods.

Figure 1. Overview of Safety and Environmental Abatement Project Communication Program

	Topics	Audience	Methods
Safety and health Survey	1	6	8
BER	2	6	8
PDS	3	6	8
Project Development	3	6	8
Project Design	4	7	8
Design Revision	4	7	8
Construction	5	7	9

1 = Survey of facility safety and/or health (S&H) conditions for presence and assessment of risk.

2 = Scope of BER, variations between BER proposals and resulting projects, entry of A/E teams into client agency space.

3 = Scope of PDS, plans to avoid or minimize common problems.

4 = Planned design phases, need for client agencies to inform GSA of other projects or changes affecting this project, major design changes, entry of A/E teams into client agency space.

5 = Construction plan of action, inspection/ monitoring program, clearance notification program, contingency plan, potential disruptions, need for client agencies to inform GSA of other projects or changes affecting this project, major design changes.

Figure 1. Overview of Safety and environmental abatement Communication Program
(continued)

6 = Customer agency management and affected PBS staff.

7 = Customer agency management and employees, Customer Service Representative's staff, other contractors at the building.

8 = Letter or meeting with agency heads; visual aids may be used.

9 = Letters or meetings with agency heads, project staff and employees as needed. Visual aids and signs may be used; air monitoring/clearance results often posted. Phone notification, especially when reoccupancy is not allowed.

4. **Affected parties.** At each project stage, regional and property management center staff should identify parties affected by the work at that stage in order to prepare for information presentation and discussion. The parties may include, but are not limited to:

a. **GSA staff.** This includes staff involved with project design and construction management in the Fee Developer, Property Management, Portfolio Manager, and affected GSA unions and employee associations. The GSA Property Management Center's Customer Service Representative leads the presentation of communications with customer agencies.

b. **GSA project contractors.** These include architectural/engineering (A/E) contractors, typically contracted by the Fee Developer or the Portfolio Manager; industrial hygiene (IH) contractors, typically contracted by the Fee Developer, the A/E, and/or the Safety and Environmental Management staff (S&EM); and other subcontractors to the A/E or IH contractors.

c. **Building customer agencies.** These include senior management at the building, facility management staff; employees, local Federal Executive Associations and similar organizations. In customer-delegated buildings, the delegated agency's facility manager assumes most communication responsibilities held by the GSA Customer Service Representative for GSA-managed facilities. GSA staff may offer, in discussions with customer agency management, to provide information to customer agencies' staff, without interfering with their management/union/employee relations. Customer agency management may be expected to share information with its employees, using its internal methods. Customer agency employees often share information among themselves and with employees of other agencies.

d. **Other contractors at the building.** These include custodial, maintenance, utility or computer services, commercial facility management, and repair and alteration construction, whether contracted by GSA or customer agencies, communication system services contracted by the Information Technology Service or customer agencies, safety and environmental abatement contractors already at the building for other projects, etc.

e. **Regulatory agencies.** These include the Environmental Protection Agency and the Occupational Safety and Health Administration, or the state and/or local agencies administering environmental and/or occupational safety and health regulations.

f. **The public.** This includes building visitors, news media, and building neighbors.

5. Building safety and environmental abatement survey(s) and assessments.

a. Information topics:

(1) Assessment of the presence (e.g., type, location, potential and extent of exposure or occurrence) and risk (e.g., to safety, health and/or property) associated with conditions in the building.

(2) GSA's safety and environmental management business practices as applied to the conditions.

(3) Implementation of abatement projects and/or operations and maintenance programs as applied to the conditions.

(4) Applicable requirements for safety and environmental protection associated with alterations (to be provided to each client agency with the authority to make alterations to the space it occupies).

(5) Limitations of the facility safety and health assessment. Some conditions may not be known until a subsequent maintenance or renovation project or other disturbance reveals its presence. If facility safety and health conditions of significant risk are encountered, appropriate control measures will be implemented.

b. Primary audiences: GSA staff and the head of each customer agency in the building or scheduled to move into the building or to a different space in the building (coordinated through the Portfolio Manager or other relocation manager), at the time of the survey or thereafter.

c. Safety and environmental abatement information presentation and question response: The Customer Service Representative leads these activities, supported by property management center and S&EM staff.

d. Presentation methods:

(1) Usually the Customer Service Representative writes to customer agency heads, after being advised of the assessment results by the project manager (if not the Customer Service Representative) and/or S&EM staff. Occasionally, a meeting with customer agency heads, facility managers and/or employees will be held; if so, this is usually led by the Customer Service Representative and attended by the Customer Service Representative (if not the Customer Service Representative), who presents the safety and environmental abatement findings, and, optionally, S&EM staff or consultants. Staff managing the inspection shall keep the Customer Service Representative apprised of its status and of communication with customer agencies, such as for gaining access to their space.

(2) Visual aids, such as flyers, newsletters, posters, signs and bulletin boards, agency-wide, regional and/or building-specific slide shows or videotapes, may be helpful; these are provided from building management funds.

6. **Building Engineering Report (BER).**

a. **Information topics:**

(1) A BER is an engineering review of the building and its equipment and systems.

(2) Customer agencies should be informed in advance that A/E review teams will be in their building for the evaluation, inspecting the space, and discussing their program and space requirements and plans.

(3) Caution should be used in describing BERs and their use, because the resulting projects commonly vary considerably from the BER proposals in both priority and scope. Limitations of the safety and environmental abatement portion of the BER should also be addressed [see building survey information, par. 5a(6)].

b. **Primary audiences:** Customer agency management, the Planning and Project Review Board (PPRB), Property Management, the Fee Developer, PortfolioManager, and Planning staff.

c. **Information presentation and question response:** The Customer Service Representative leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Planning staff.

d. **Presentation methods:** Usually the Customer Service Representative will write to customer agency heads, after being advised by the project manager (if not the Customer Service Representative), S&EM staff, and/or the BER manager in the Portfolio Manager (who may be the Contracting Officer Representative for the BER contract). Occasionally a meeting with customer agency heads, facility managers and/or employees will be held; if so, this is usually led by the Customer Service Representative, who presents the findings, and, optionally, S&EM staff or consultants and the Portfolio Manager. Visual aids may be used [see presentation methods, par. 5d(2)]. The BER manager shall keep the Customer Service Representative apprised of its status and of communication with customer agencies.

7. Prospectus Development Study (PDS).

a. Information topics:

(1) A PDS is a study which organizes the concepts for major renovation or new construction projects in a standard format to present to Congress for line-item funding.

(2) GSA's safety and environmental abatement business practice [see par. 5a(2)] should be reiterated.

(3) Information for obtaining concurrence by customer agencies with the proposed project scope at this stage as it affects their space, and GSA's proposed project methodology.

(4) Customer agencies and GSA should work to minimize or avoid common problems. Experience has indicated several common problem subjects; attention should be given to anticipating and, thereby, avoiding: excessive customer hopes (that project will be done quickly, or as initially conceived, etc.); disappointment that decisions in this stage are not final; premature inducement of a high level of customer activity; confusion from different plans among different customers for reasons justified within GSA but not evident or acceptable to the customers; confusion from variations in project design development, such as among drafts and the final PDS, and, later, among versions of the funding and design documents (some customers may believe these variations indicate excessive GSA uncertainty, rather than sensitivity to addressing project-related issues); becoming locked into a single project approach; excessive reliance on the details of the safety and environmental abatement portion of the PDS [see safety and environmental abatement survey limitations, par. 5a(6)].

b. Primary audiences: Customer agency management, the PPRB, and the Fee Developer.

c. Information presentation and question response: The project manager leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer, Portfolio Manager and Planning staff, and, as appropriate, the regional spokesperson.

d. Presentation methods: Usually the Customer Service Representative will Write to customer agency heads, after being advised by the project manager (if not the Customer Service Representative) and the manager of the PDS. Meetings with customer agency heads, facility managers and/or employees may be held; if so, they are usually led by the Customer Service Representative and attended by the project manager (if not the Customer Service Representative), who presents the safety and environmental abatement findings, and, optionally, S&EM staff or consultants, the Portfolio Manager and the Fee Developer. Visual aids may be used [see presentation methods, par. 5d(2)]. The PDS manager shall keep the Customer Service Representative apprised of its status and of communication with customer agencies.

8. Project development and funding.**a. Information topics:**

(1) Most of the information provided here is similar to that provided during PDS development [see par. 7a].

(2) In addition, progress statements are appropriate at major funding steps, such as the submission of the prospectus to Congress; approval of the prospectus and any significant changes to its scope or funding; appropriation of funds, whether the project is of prospectus-level or smaller, again describing any significant changes to its scope or funding.

(3) Staff managing the project development shall keep the Customer Service Representative apprised of its status and of communication with customer agencies.

b. Primary audience: Customer agency management.

c. Information presentation and question response: The Customer Service Representative leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Planning staff.

d. Presentation methods: Usually the Customer Service Representative will write to customer agency heads, after being advised by the project manager (if not the Customer Service Representative) and the manager of the development of the project. Visual aids may be used [see presentation methods, par. 5d(2)].

9. Project design.

a. Information topics:

(1) Customer agencies should be advised of planned phases of the design of this specific project. Customer agencies and the Customer Service Representative should be asked to inform the design manager of other current or planned projects, reorganizations, etc., which may affect the project. (The design manager should consult with managers of the design or construction of other projects at the building which may affect this project.)

(2) Customer agencies should be advised that the project team will be inspecting their space and conversing with their management and employees as required for project design. Such conversations should be coordinated with customer agencies' management so as not to interfere with their management/union/employee relations.

(3) Members and functions of the project design team can be identified to the customer agencies. For projects involving safety and environmental abatement, the functions of GSA (including the Fee Developer, Portfolio Manager, S&EM staff, the Customer Service Representative and the project manager) and contractors (including the A/E and GSA or A/E contractors, such as environmental or civil engineers, IH's, space planners, etc.) can be described.

(4) Contractors at the building should, as appropriate for the effect of the project on their work, be informed of the project design and involved in the project design survey.

(5) The possibility that unexpected facility safety or health conditions may be encountered during the project should be noted [see building survey information, par. 5a(6)].

b. Primary audiences: Customer agency management and employees (in coordination with customer agency management), since members of the project team will be entering their space, and renovation of their space may be involved.

c. Information presentation and question response: The Customer Service Representative leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Portfolio Manager staff.

d. Presentation methods:

(1) Usually the Customer Service Representative will write to customer agency heads, after being advised by the project manager (if not the Customer Service Representative) and the design manager. Meetings with customer agency heads, facility managers and/or employees may be held; if so, they are usually led by the Customer Service Representative and attended by the project manager (if not the Customer Service Representative), who presents the safety and environmental abatement findings, the design manager, and, optionally, S&EM staff or consultants

and the Fee Developer. Visual aids may be used [see presentation methods, par. 5d(2)]. The design manager shall keep the Customer Service Representative apprised of its status and of communication with customer agencies.

(2) For a major project involving safety and environmental abatement work (such as fire sprinkler installation, underground storage tank closure, or a project disturbing large amounts of asbestos), a descriptive project brochure, provided from building management funds, should be developed, with copies printed for distribution to building occupants and the public.

10. Major project design evolution and revisions.

a. Information topics:

(1) Periodic communication of the project status should be made. The frequency (e.g., annual, semiannual, etc.) should reflect project and building conditions, and should be sufficient to ensure that customer agencies do not perceive, even if incorrectly, that they have been overlooked during the project design.

(2) Variations, if any, in the project design from its previous status. These should be described as soon as it is clear that they will occur, even if some details have not been resolved. The customers should be reminded of the limitations of safety and environmental surveys and prealteration asbestos assessments [see building survey information, par. 5a(6)].

b. Primary audiences: Customer agency management and employees (in coordination with customer agency management), and contractors in the building, to the extent that project evolution or revisions affect their space or operations.

c. Information presentation and question response: The Customer Service Representative leads these activities, supported by property management center and S&EM staff, the Portfolio Manager, the Fee Developer and Portfolio Manager staff.

d. Presentation methods: Usually the Customer Service Representative will write to customer agency heads, after being advised by the project manager (if not the Customer Service Representative) and the design manager. Visual aids may be used [see presentation methods, par. 5d(2)].

11. Construction.

a. Information topics:

(1) Changes in scope. During construction bidding, customers should be notified of any major changes in the scope of project design. Changes should be described as soon as contractually permissible when it is clear that they will occur, even if some details have not been resolved.

(2) Preconstruction meeting. Topics related to Facility safety and health discussed at a preconstruction meeting with client agencies following contract award may include:

(a) The construction contractor's plan of action, with attention to the protection of space outside the work area, the workers and the work area itself, and the contractor's contingency plan for fires, accidents or pollutant releases

(b) The quality control program of the project construction manager, including visual and physical inspection and air and/or bulk monitoring (as appropriate) to be performed on behalf of GSA

(c) Review of firesafety conditions prior to acceptance of equipment and/or renovated space

(d) Construction contractor's notification of regulatory agencies

(e) Means of disseminating facility safety and health information, including clearance results allowing reentry of client spaces or initiating other events affecting client agencies, and air monitoring results in and around the work areas

(f) Means of resolving potential project-related problems, such as from an accident, fire, and/or release of pollutants inside or outside the work area, inability to clear a space after a phase of work, generally aggravating conditions, project delays, or client agency mission schedule requirements

(g) Project-related changes in the building's Occupant Emergency Plan, such as for developing a means of contacting client agencies if a space can not be cleared for reoccupancy

(h) Changes in the contract or plan of action affecting client agencies, who should be reminded of the limitations of facility safety and health surveys [see facility safety and health survey information, par. 5a(5)].

(3) Other projects. Customer agencies and the Customer Service Representative should be asked to inform the manager of the construction of other current or planned projects, reorganizations, etc., which may affect the project. (The manager of the construction should consult with managers of the design or construction of other projects at the building which may affect this project.)

(4) Disruption of routines. The Customer Service Representative's office staff should be informed of the projected extent of disruption of building operating routines, so that they can appropriately serve customer agencies. Means for

responding to safety and environmental abatement-related and other customer agency or contractor complaints. In particular, the Customer Service Representative's office staff should be able to forward safety and environmental abatement-related incident reports to the appropriate contact person (e.g., construction management contract representative, Customer Service Representative, planner/estimator).

(5) Completion. The completion of major phases of construction work, such as safety and environmental abatement-related work, a renovation phase, and/or the whole project should be announced. Customer agencies should be thanked for their cooperation.

b. Primary audiences: Customer agency management and employees (in coordination with customer agency management), the Customer Service Representative's staff, and other contractors at the building.

c. Information presentation and question response: The Customer Service Representative leads these activities, supported by property management center and S&EM staff, the Fee Developer and Portfolio Manager staff.

d. Presentation methods:

(1) Usually the Customer Service Representative will write to customer agency heads, after being advised by the project manager (if not the Customer Service Representative) and the manager of the construction. Meetings with customer agency heads, facility managers and/or employees may be held; if so, they are usually led by the Customer Service Representative and attended by the project manager (if not the Customer Service Representative), who presents the safety and environmental abatement findings, the manager of the construction, and, optionally, S&EM staff or consultants and the Fee Developer. Visual aids may be used [see presentation methods, par. 5d(2)].

(2) Periodic project update meetings should include safety and environmental abatement work as a regular agenda item.

(3) When taken as part of a project, air or water monitoring results are frequently provided on bulletin boards and/or log books in lobbies or in hallways near the Customer Service Representative's or maintenance office. Environmental clearance results for reentry of customer spaces are often posted on bulletin boards in lobbies or in hallways near the Customer Service Representative's or maintenance offices. Notice of the decision to allow reoccupancy is sometimes telephoned prior to reoccupancy to the head or safety officer of the customer agency occupying the affected space and/or the lead agency in the building.

(4) Should reoccupancy not be allowed at the expected time, telephone notification should be made in advance of the expected time, whenever feasible, to the head or safety officer of the agency occupying the affected space and the lead agency in the building, using previously obtained telephone lists.

12. Abbreviations used.

A/E	Architectural/engineering firm
BER	Building Evaluation Report
GSA	General Services Administration
IH	Industrial hygiene firm
PBS	Public Buildings Service
PDS	Prospectus Development Study
PPRB	Planning and Project Review Board
S&EM	Safety and Environmental Management staff

Technical Guide

INDOOR FIRING RANGES

BACKGROUND

There are a number of potential health hazards associated with operations in an indoor firing range. This technical guide discusses occupational health hazards that can typically occur in an indoor firing range and ways to prevent these hazards. Design considerations for ventilation and noise, sampling procedures, checklists for inspection of ranges, and Occupational Safety and Health Administration (OSHA) regulations are also covered.

DISCUSSION

Sources of Exposures

Airborne contaminants are produced as byproducts of weapons firing and include lead, carbon monoxide and aldehydes. Weapons firing also causes hazardous levels of noise.

Of the airborne contaminants produced while firing guns, lead is of the greatest concern. There are several different sources for lead generated by firing weapons. The bullet primer contains approximately 25-30 milligrams of material, of which about 35 percent (9-11 milligrams) is lead styphnate and lead peroxide. The lead styphnate is used as a detonator.

Lead vaporizes during firing due to the heat of the explosion. Lead dust is also produced from friction and fragmentation of the bullet as it passes through the gun. Fragmentation occurs from cylinder and barrel misalignments and to gaps from wear and manufacturing tolerances.

The 20000 Fahrenheit temperature generated at firing causes the gases to expand. The expanding gases create a pressure build-up of approximately 18,000 to 20,000 pounds per square inch in the cylinder that blows the dust and fumes from the weapon. Much of the dust and fumes produced are blown at right angles to the direction of fire, commonly known as "side blast". The side blast creates turbulence in the breathing zone of the shooter, and increases exposure to lead dust and fumes.

Noise levels that occur during firing often exceed OSHA regulations. When fired, the bullet breaks the sound barrier in striking the surrounding air, resulting in the familiar "crack". This particular type of noise is known as impulse noise. A secondary source of impulse noise is generated when the bullet strikes the bullet trap (or other surface). The shooter is also exposed to noise from all the other shooters' weapons as well. This noise is less intense, but is more frequent.

Adverse Health Effects From Exposure to Hazards

Lead poisoning was one of the first recognized occupational related diseases. The National Institute for Occupational Safety and Health has conducted studies in industry to determine the health effects of overexposure to lead. They have determined that many adults with blood lead levels of 80 micrograms per decaliter ($\mu\text{g}/\text{dl}$) or greater have symptoms or signs of acute lead poisoning, although in some individuals, symptoms may be so mild they are overlooked.

Common symptoms of acute lead poisoning are loss of appetite, nausea, vomiting, stomach cramps, constipation, difficulty in sleeping, fatigue, moodiness, headache, joint or muscle aches, anemia, and decreased sexual drive. Severe health effects of acute lead exposure include damage to the nervous system, wrist or foot drop, tremors, and convulsions or seizures. Acute lead poisoning from uncontrolled occupational exposures has resulted in death.

An adult who is exposed to low or moderate levels of lead over a long time may develop chronic lead poisoning. The early effects of lead poisoning are not specific and may include fatigue, irritability, headache, weight loss, stomach ache, or constipation. Lead can also cause damage without any symptoms. Lead poisoning can affect learning ability, hearing, coordination, the formation of blood cells, cause hypertension, and can damage the kidneys, digestive system, and reproductive systems. These health effects may occur at blood lead levels below 50 $\mu\text{g}/\text{dl}$.

Chronic lead poisoning may also result after lead has accumulated in the body over time, mostly in the bone. Long after exposure has ceased, some physiological event, such as illness or pregnancy, may release this stored lead from the bone and produce adverse health effects.

Pregnant women and their unborn children are of special concern. Fetal development and viability can be affected by exposure to lead at blood lead levels of 10 to 15 $\mu\text{g}/\text{dl}$. Prenatal exposure to low lead levels increases the risk of premature birth, reduced birth weight, stillbirth and neurobehavioral deficits. Lead has been found to cause birth defects in animals and may be related to minor malformations in humans. Some studies have suggested that chronic exposure to lead may result in male infertility.

Carbon monoxide and aldehydes are also produced during weapons firing. Overexposure to carbon monoxide decreases the ability of the blood to carry oxygen to the tissues. Inhalation of carbon monoxide at high levels (greater than 50 parts per million) can cause headache, nausea, dizziness, weakness, rapid breathing, and unconsciousness. Exposure to extremely high levels of carbon monoxide can cause death. Carbon monoxide exposure can aggravate heart disease and artery disease and may cause chest pain in those with pre-existing heart disease. Aldehydes are irritating to the skin, eyes, and respiratory tract. Exposure to high levels of aldehydes can damage the respiratory tract and the central nervous system.

Overexposure to noise in an indoor firing range can result in temporary hearing loss, and, over time, permanent hearing loss. A temporary threshold shift occurs after exposure to loud noise, making sounds seem muffled or softer. Hearing usually returns to normal within 14 hours, but repeated exposures can make this condition permanent.

Symptoms of permanent hearing loss are similar to temporary hearing loss, but are persistent. Permanent hearing loss usually occurs 5 to 10 years after continuous exposure to hazardous levels of noise.

Occupational Safety and Health Administration (OSHA) Regulations

OSHA regulates lead exposure in the operations of indoor firing ranges, including the range master, custodial, and routine maintenance work, in 29 Code of Federal Regulations (CFR) 1910.1025. During renovation or demolition work in indoor firing ranges, OSHA regulates lead exposure in 29 CFR 1926.62. Under these standards, the Permissible Exposure Limit for inorganic lead is 50 micrograms per cubic meter (**11g/m³**) of air as an 8-hour time-weighted average, with an action level of 30 µg/m³ as an 8-hour time-weighted average.

These standards have provisions for exposure monitoring, engineering and work practice controls, training, medical monitoring, medical removal, record keeping, and job removal. The provisions of the general industry standard, 29 CFR 1910.1025, are discussed in this technical guide. The corresponding provisions of the lead in construction standard, 29 CFR 1926.62, are discussed in the GSA Safety and Environmental Management Lead-Based Paint Technical Guide E402.

OSHA requirements for noise are found in 29 CFR 1910.95. The OSHA limit Permissible Exposure Limit for noise is 90 decibels measured on the A scale (dBA), as an 8 hour time-weighted average, with an action level of 85 dBA, as an 8 hour time-weighted average. The Permissible Exposure Limit for impulse noise is 135 decibels peak sound pressure. This standard has provisions for exposure monitoring, engineering and work practice controls, training, medical monitoring, and record keeping. These provisions are discussed in this technical guide.

GSA PRACTICES

Inspection of Indoor Firing Ranges

Initial and annual inspection should be performed at all indoor firing ranges to ensure compliance with health and safety standards. Initial inspections should be performed on a one-time basis by a qualified industrial hygienist or safety engineer to determine the status of the indoor firing range for use. An initial inspection checklist is given in attachment 1; the detailed inspection checklist in attachment 2 should be used in the initial and the annual inspections.

Indoor firing ranges should be classified as safe, limited use, or unsafe based on the initial inspection findings. These classifications mean:

Safe: Permits authorized firing with no restrictions.

Limited Use: Permits authorized firing under controlled conditions. The personnel exposure limits for intermittent lead exposure table (Figure 1) gives the maximum hours of allowable exposure per day and should be used for limited operation of the indoor firing range.

Unsafe: Indoor firing range is not authorized for use under any conditions.

Annual inspections, using the detailed inspection checklist (attachment 2), should be made by safety, industrial hygiene, or engineering personnel to ensure safety standards and procedures are maintained in the operation of the range. A special inspection should be performed if conditions in a range change, such as increase in the frequency of use, or if higher caliber of ammunition and/or different types of weapons are used.

Air Sampling for Lead

OSHA requires that exposure monitoring be performed to determine if personnel are exposed to lead at or above the OSHA action level. Lead exposures for personnel are determined from general area and breathing-zone samples. Personnel exposed to lead at levels that exceed OSHA's Permissible Exposure Limit for more than 30 days per year, must be enrolled in a medical surveillance program.

Collect all lead samples on cellulose ester filters of 37 millimeter diameter with a pore size of 0.8 microns, in a three-piece, closed face cassette. The sampling rate should be 1 to 4 liters per minute for a minimum volume of 500 liters.

Sample on the firing line, 10 feet behind the firing line, and in adjacent area (e.g., range office, supply room, or hallways). In small ranges (less than six firing positions), samples should be taken at each firing position on and off line. In

larger ranges, breathing-zone and general-area samples should be taken in every other firing position and off line.

Permanently assigned range personnel should have breathing-zone lead in air samples taken. Exposures to other personnel may be evaluated using data obtained from general-area and breathing-zone samples. Take at least one air sample for lead in an area adjacent to the range as defined above during each monitoring period. This sample should indicate whether or not lead contamination is confined to the range.

The following factors are critical to proper range evaluation.

- Sample during periods of maximum use.
- If firing is over an extended period of time, allow time for possible buildup of airborne concentrations before sampling.
- Sample during the use of higher-caliber ammunition if more than one type of ammunition is used.

Frequency of airborne lead monitoring is determined by the following lead levels:

- Under 30 $\mu\text{g}/\text{m}^3$ - no further monitoring required, except if there is a change of equipment, process, control, personnel or a new task initiated that may result in lead exposure.
- At least 30 $\mu\text{g}/\text{m}^3$ but under 50 $\mu\text{g}/\text{m}^3$ - at least every 6 months, until two consecutive measurements, taken at least 7 days apart, are below 30 $\mu\text{g}/\text{m}^3$ (monitoring can be discontinued at this point).
- At least 50 $\mu\text{g}/\text{m}^3$ - every 3 months, until two consecutive measurements, taken at least 7 days apart, are under 50 $\mu\text{g}/\text{m}^3$. If lead levels are at least 30 $\mu\text{g}/\text{m}^3$ but under 50 $\mu\text{g}/\text{m}^3$, monitoring must be done at least every 6 months, until two consecutive measurements, taken at least 7 days apart, are under 30 $\mu\text{g}/\text{m}^3$ (monitoring can be discontinued at this point).

Affected GSA employees or their designated representatives must be given an opportunity to observe any monitoring of employee exposure to lead. Notify affected GSA employees of their exposure levels in writing within five working days after the receipt of the monitoring results. If results indicate exposure levels exceed the Permissible Exposure Limit, a written statement shall be included stating that the Permissible Exposure Limit was exceeded and describing the corrective action taken or to be taken to reduce exposure to or below the Permissible Exposure Limit.

Airborne lead samples should be analyzed by a laboratory accredited by the American Industrial Hygiene Association's Laboratory Accreditation Program for metals on filters.

Measuring Noise

Monitor employees for noise to determine the level of exposure. Perform monitoring in accordance with OSHA Hearing Conservation Regulation, 29 CFR 1910.95. Calibrate all sound measuring equipment before and after each use according to the manufacturer's instructions.

Use either a noise dosimeter or sound level meter to measure noise. Dosimeters must meet the requirements of the American National Standards Institution (ANSI) Standard S1.25 - 1978, "Specifications for Personal Noise Dosimeters". Sound level meters must meet the requirements of ANSI Standard S1.4 - 1974 (Type 2) and must be set to the A-Weighted slow response mode. Impulse noise may be measured with a sound level meter meeting ANSI S1.4 - 1971, Type 1 or Type 2 specifications, with a peak-hold capacity or accessory.

Affected GSA employees or their designated representatives must be given an opportunity to observe any monitoring of employee exposure to noise. Notify all GSA employees who are exposed at or above an 8 hour time-weighted average of 85 dBA with the results of the monitoring.

Measuring Ventilation

Measure make-up and exhaust air velocities with a calibrated air velocity meter. Exhaust or make-up volume can be determined by pitot tube traverse. Refer to reference 4 for information on how to perform a pitot tube traverse.

Approximate down-range air velocity by using a 30 second smoke candle and stop watch. Ignite the smoke candle behind the firing line, and time the smoke from the moment the first plume crosses the firing line until it reaches the bullet trap. Calculate the air velocity by dividing the range distance of length (from firing line to bullet trap) (D), by the time (T), or $D/T = \text{feet per minute}$. A minimum of 35 feet per minute is recommended. This is equal to 35 cubic feet per minute per square foot of cross-sectional area. (This is equivalent to about 1.1 meters per minute, or 1.1 cubic meters per square meter of cross-sectional area.)

Observe the range during the smoke evaluation for any "dead spots," swirling of smoke uprange, or other turbulent airflow motions that may allow for increased exposure at or behind the firing line. These areas should be noted in the inspection report.

Ventilation Control

A properly designed and maintained ventilation system should control contaminants produced while firing weapons. If the ventilation system is effective in reducing lead levels to below the OSHA Permissible Exposure Limit, then it should be sufficient to remove other contaminants.

Each range should have its own ventilation system exhausted to the outside to prevent circulation of contaminated air from the range into other areas of the building. The firing range should be maintained at a slight negative pressure with respect to adjacent areas (e.g., range office, other offices, halls, restrooms, lunchroom, etc.) to prevent the escape of contaminants. Exhaust air should exceed make-up air by 10 percent to provide the slightly negative pressure in relation to adjacent areas.

Optimum ventilation systems should include make-up air behind the firing line and exhausted air at the target line or bullet trap. The minimum velocity at the firing line should be 50-75 feet per minute. A minimum down-range conveyance velocity of 35 feet per minute (11 meters per minute) should be maintained.

All air should be exhausted downrange at the bullet trap. For maximum efficiency the exhaust ducts should be placed behind and at the apex of the bullet trap. An alternative (if the preferred arrangement is impractical) is to place the exhaust ducts on the side of the wall and slightly in front of the apex.

All air being exhausted from the range should be filtered using HEPA filters, or equivalent filters to meet State air pollution regulations for airborne lead (if required by the State). Recirculation of air is not advised unless lead and carbon monoxide are controlled by high-efficiency particulate filtration (for lead) and alarm systems (for carbon monoxide in air and the pressure drop across the filters). In this case, regular maintenance and calibration of the filtration and alarm systems must be part of the environmental management program for the range.

For optimum air distribution there should be a minimum distance of 15 feet (5 meters) from the shooter's position to the wall directly behind the shooter. The supply air inlets should be placed on the back wall if possible, or placed in the ceiling behind the shooters. Proper placement of supply air inlets and the 15 foot (5 meter) distance from the back wall to the shooter's position will ensure an even air flow pattern across the shooter and minimize turbulence at the firing line. Caution must be exercised in design to ensure even air flow across the shooting position. Excessive turbulence could cause the contaminant to be blown back into the shooter's face.

An important factor in ventilation design is that the supply air intakes to the range should be located at that part of the building upwind from the exhaust stacks. In addition, increased heights of exhaust with high outlet velocities will minimize the

possibility of contaminated air being re-introduced and circulated throughout the range.

The supply and exhaust system must be electrically interlocked to eliminate the possibility of turning one system on and not the other. The system should operate on one fan speed and not on multiple fan speeds.

Administrative Practices

Exposure to lead can be controlled through administrative controls, such as limiting time people can fire. The U. S. Army has developed a table for controlling intermittent lead exposure. Medical surveillance is not required for intermittent users if the maximum allowable exposure hours from the Table of Lead Exposure Limits (Figure 1) are enforced.

The table lists the maximum allowable hours of exposure based on the airborne lead concentration and the number of days firing per year. These criteria should be used as an interim control measure only and every effort first should be made to reduce the airborne lead levels to 30 µg/m³ or less.

Other potential lead exposure, including off-duty firing, may contribute to an individual's overall exposure and should be considered in establishing maximum allowable exposure time. The maximum allowable exposure hours should be halved for intermittent range users under 17 years of age.

Other administrative controls that can be used to reduce lead levels include:

- Limit or prohibit practice firing with ammunition higher than .22 caliber.
- Install target return mechanisms to keep shooters out of the down range area.
- Prohibit the use ofunjacketed lead bullets.
- Rotate range personnel to reduce their lead exposure.

Noise Management

Reverberation and impulse noise occur in an indoor firing range. To minimize noise, all reflecting walls should be covered with high efficiency sound absorbing material. Absorbing material can, for example, be fibrous glass insulation covered with perforated aluminum or steel sheets with openings equivalent to 10-15 percent of the area to permit sound absorption. The coverings should be designed to permit easy access to the acoustical material for periodic replacement due to accumulation of lead dust.

The floors directly behind the shooter gallery should be covered with acoustical flooring carpet. Range officer quarters should be acoustically treated to reduce noise levels.

Much of the secondary noise can be eliminated at the bullet trap by applying an epoxy resin or equivalent to the back side of the trap plates. The bullet trap should never be anchored or attached to any structural support for the building without appropriate energy-absorbing linkages. The energy of the bullet striking the trap can be transmitted as noise and vibration throughout the building.

Indoor Firing Range Maintenance

A routine range maintenance program is essential to ensure proper operation of the range and to minimize hazards. Range personnel should also ensure that no furniture, equipment, or material are stored downrange in an actively used range to prevent ricochets.

Inspect each range periodically to determine repair requirements. Monitor intake and exhaust velocities periodically by performing pitot traverses of the duct to insure proper carrying velocities. Refer to reference 4 for information on how to perform a pitot tube traverse.

Cleaning of the range can be done by using high efficiency particulate air (HEPA) filter equipped vacuum cleaners, and/or wet methods. Dry cleaning methods without HEPA vacuuming, such as using a hand broom, should be prohibited. The ventilation system should be in operation at all times while the range is in use and during clean-up. Refer to the personal protective equipment and hygiene practices sections of this guide for types of equipment to wear and what practices to use while performing these operations.

Wet cleaning requires two containers of water. One container is for wetting the applicator (mop, rag, sponge, etc.); the other container is for rinsing the applicator after the dust has been wiped from the surface. The rinsing container must be emptied often into a sealable container unless approval has been obtained from the State or local environmental agency to dispose of the contaminated water into the sewer system.

After each daily firing session, the firing line should be damp mopped and all horizontal surfaces, such as benches and chairs, should be cleaned. The two-container system for wet cleaning should be used for mopping and cleaning. Every month, the bullet trap should be cleaned of lead particles and bullets.

If a plate/sand trap type bullet stop is used, it is important to screen the sand regularly to remove lead and reduce the possibility of backscatter. Determine the cleaning schedule based on the frequency of firing and the amount of lead buildup.

If the range is being upgraded or converted, the range must be thoroughly cleaned. Cleaning can be done with the two container method for damp/wet cleaning, or a HEPA vacuum cleaner can be used. First the ceilings should be cleaned, then exposed steel beams, bar joists, pipes, etc. After this is done, the walls should be cleaned from the top down, and lastly the floor is cleaned.

If the range is being converted to another use, sand in the bullet trap should be thoroughly wetted and placed in 55 gallon drums. The drum should be sealed, labeled, and removed from the range. Once the sand has been removed, the steel plate, baffles, side plates, etc., may be taken down. Each piece of steel should be cleaned of dust before removal from the site.

If the range is being upgraded, the top 3 inches of sand in the bullet trap must be thoroughly raked, separating the pieces of lead. Lead pieces should be removed and placed in a 6 mil plastic bag.

Special care must be taken in removing lead contaminated waste from the range. All lead contaminated waste should be placed in closed, labeled containers. Open containers should not be used to transport lead contaminated wastes from the range to the storage area. The storage area should be locked and posted.

Disposal

All lead bullets, fragments, and shell casings should be recycled if possible. If a recycler cannot be found, bullets and fragments will probably have to be disposed of as hazardous waste.

Dispose of lead and lead contaminated materials, such as mops, sponges, and cleaning water, in accordance with Environmental Protection Agency (EPA), State and local regulations.

EPA requires that a representative sample of lead contaminated materials to be disposed of be tested to determine if materials are regulated under the Resource Conservation and Recovery Act (RCRA). Use the Toxicity Characteristic Leaching Procedure (TCLP; 40 CFR Part 261, Appendix 11) to determine if lead contaminated material is covered under RCRA. The TCLP is designed to determine the amount of lead that could be leached out if the waste came into contact with groundwater at a municipal waste dump. If the TCLP determines that the lead concentration in the liquid that leaches is 5 parts per million or greater, the waste is regulated by RCRA, and must be designated as hazardous waste.

Refer to GSA Safety and Environmental Management Hazardous Waste Technical Guide E201 for more information on hazardous waste regulations.

Signs

Post warning signs in the firing range stating the following:

- Safety precautions to be used when handling weapons.
- Conditions under which the range may be used.
- Type(s) of weapons and ammunition allowed.
- Personal protective equipment required.
- Eating, smoking or drinking prohibited in the range.
- Site specific rules and regulations.

Personal Protective Equipment

Everyone in the indoor firing range must wear hearing protection whenever firing is occurring. Either ear plugs or ear muffs may be used as hearing protection. Each shooter should have their own personal hearing protection. A variety of hearing protection should be provided to allow for individual variations and preferences. If ear plugs are used, they must be properly fitted. In case of extremely loud handguns or a number of people firing at one time, it is advisable to wear both plugs and muffs simultaneously.

Personnel performing the following operations should wear additional personal protective equipment: cleaning the firing range using wet methods, HEPA vacuuming, removing or screening bullet trap sand, removing bullets and debris from the bullet trap, repairing the bullet trap or the heating/ventilation/air conditioning system (HVAC) system, or changing the filters in the HVAC system. At a minimum, personnel should wear protective coveralls, shoe covers and an airpurifying respirator with HEPA filters, approved by the National Institute for Occupational Safety and Health. When performing wet cleaning, workers should also wear rubber boots and rubber gloves.

Place all contaminated protective clothing that are to be cleaned, laundered, or disposed of, in a closed, labeled container in the change area. Inform the person, in writing, who cleans or launders protective clothing or equipment of the potentially harmful effects of lead exposure.

Follow GSA and OSHA criteria for respiratory protection. This criteria includes fit-testing, training, medical surveillance, cleaning and storing requirements. Requirements can be found in the following publications:

- GSA Handbook ADM P 5940.1
- 29 CFR 1910.1025(f)
- GSA Selection, Care and Use of Respiratory Protection formaintenance Work Standard Operating Procedure

Hygiene Practices

Personal hygiene is an important element of protecting personnel from lead dust. All range personnel, shooters, and maintenance workers exposed to lead must wash their hands and faces before eating, drinking, applying cosmetics, or using tobacco products. No one should be allowed to eat, drink, apply cosmetics, or use tobacco products in the firing range.

Personnel performing maintenance work in the range should have a change area to store street clothes. Change areas must have separate storage facilities for street clothes and protective work clothing and equipment, to prevent crosscontamination. Workers should change into work clothes and shoes at the worksite.

Workers must change back into their street clothes after washing or showering and before leaving the worksite. Shower facilities, where feasible, are to be provided when exposure levels exceed the Permissible Exposure Limit. Where showers are not provided, hand washing facilities should be provided for workers to wash their hands and face at the end of the work-shift. These procedures are necessary to prevent the accumulation of lead dust in the workers' cars and homes, and to protect family members from exposure to lead.

Training

Train all users of the range in safety rules of the range and correct ways to handle weapons. Users must understand range commands, such as cease fire, and what actions they must take. Users must be trained on how and when to use hearing and eye protection.

Train all range officers and maintenance workers who are exposed to lead above the Permissible Exposure Limit about the hazards of lead. This training is in addition to the hazard communication training required with OSHA's Hazard Communication Standard, 29 CFR 1910.1200, and the GSA Written Hazard Communication Program Standard Operating Procedure (see GSA Handbook ADM P 5940.1). Training should be performed by GSA safety and environmental personnel or contractors. Include the following information:

- The content of the lead in general industry regulation, 29 CFR 1910.1025 and its appendices.

- The specific nature of the operations which could result in exposure to lead above the action level.
- The purpose, proper selection, fitting, use, and limitations of respirators.
- The purpose and a description of the medical surveillance program.
- The contents of the written lead exposure compliance plan.
- Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician
- The employees' right of access to their own medical files and exposure records.
- Engineering controls and work practices associated with the employee's job assignment.
- Range safety and administrative regulations.

All GSA employees whose noise exposure equals or exceeds 85 dBA, as an 8-hour, time-weighted average, must also receive training on the hazards of noise, as required by 29 CFR 1910.95. Include in the training program the effects of noise on hearing, the purpose of hearing protectors, the advantages and disadvantages of different types of hearing protectors, attenuation of various hearing protectors; and instructions on how to select, fit, use, and care for hearing protectors. The purpose of the audiometric testing and an explanation of the testing procedures must also be covered.

Contractors performing operations that may result in lead or noise exposure are responsible for training their employees.

Medical Surveillance for Lead

OSHA requires that GSA workers be enrolled in a medical surveillance program when they are exposed to lead levels above 30 µg/m³ for more than 30 days per year. Medical surveillance consists of biological monitoring of worker blood lead levels and medical examinations. Medical examinations and procedures must be performed by or under the supervision of a licensed physician. Medical surveillance provisions shall follow requirements given in Appendix C to 29 CFR 1910.1025 and GSA Handbook ADM P 5940.1.

Frequency of medical examinations and consultations for employees above the lead action level are:

- At least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 months indicated a blood lead level at or above 40 micrograms per decaliter (ug/dl).
- As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice concerning the effects of current or past exposure to lead on the employee's ability to procreate a healthy child, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during use.
- As medically appropriate for employees either removed from exposure to lead or for a final medical determination.

The physician conducting examinations must be given the following:

- a copy of the lead in general industry regulation (29 CFR 1910.1025);
- a description of the worker's job duties as those relate to lead exposure;
- the worker's exposure level or anticipated exposure level to lead and to any other toxic substances (if applicable);
- type of personal protective equipment used or to be used;
- prior blood lead determinations; and
- all prior written medical opinions.

The physician shall give a written medical opinion to the designated GSA person, who oversees the local GSA medical surveillance program, and this person in turn must give a copy of the opinion to the employee. The written medical opinion shall include the following:

- The physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead.
- Any recommended special protective measures or limitations that need to be provided to the employee.

- A determination on whether an employee can wear a respirator, limitations on the employee to use a respirator, and whether a powered air-purifying respirator can be used if the employee cannot wear a negative pressure respirator.
- The results of the blood lead determinations.

GSA employees must be notified in writing of their blood lead levels within five working days after the receipt of biological monitoring results.

Workers are removed from a job whenever:

- Blood tests indicate lead levels of at least 50 $\mu\text{g}/\text{dl}$.
- Whenever an employee is exposed to lead at or above the action level and a physician determines that the employee has a medical condition which places the employee at increased risk.

A worker may only return to former job status when two consecutive blood sampling tests indicate that the employee's blood level is at or below 40 $\mu\text{g}/\text{dl}$ or when a subsequent medical evaluation determines that the employee is no longer at increased risk. Any workers removed from a job must remain at the same pay and seniority for up to 18 months.

Chelation (a type of chemically binding a material such as lead) can only be done if it is medically necessary and performed under the supervision of a licensed physician in a clinical setting. Routine chelation to prevent workers from developing lead poisoning is prohibited.

Contractors performing cleaning services for indoor firing ranges and/or removal of lead are responsible for providing medical surveillance for their employees.

Medical Surveillance for Noise

OSHA requires that GSA employees exposed to noise levels that equal or exceed an 8-hour time-weighted average of 85 dBA be enrolled in a hearing conservation program. Employees must have a baseline audiogram within 6 months of an employee's first exposure at or above the action level. As long as the employee is exposed to noise levels at or above the action level, the employee will receive annual audiograms.

Each audiogram is analyzed to determine if a significant threshold shift has occurred as compared to the baseline audiogram. A significant threshold shift is defined by OSHA as a change in hearing threshold relative to the baseline audiogram of an average of 10 decibels or more at 2000, 3000, and 4000 Hertz (cycles per second) in either ear.

If a hearing shift (loss) is detected, the employee is retested in 30 days and a trained professional reviews the audiograms to determine if further evaluation is necessary. The employee is given hearing protectors or retrained in the use of hearing protectors if they are currently used. The employee is retested in one year. Refer to the GSA Handbook, ADM P 5940.1 (reference 6) for more information.

Recordkeeping

- OSHA requires GSA to keep all lead monitoring records and other data used in conducting exposure assessment. Data shall include the following:
- The date(s), number, duration, location and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure.
- A description of the sampling and analytical methods used and evidence of their accuracy.
- The type of respiratory protection and/or hearing protection used.
- Name, social security number and job classification of each employee monitored and of all other employees whose exposure the measurement is intended to represent.
- Environmental variables that could affect the measurement of the employee exposure.

Establish and maintain medical surveillance records. Each record shall include:

- The name, social security number and description of the duties of each employee participating in medical surveillance.
- A copy of the physician's written opinions.
- Results of any airborne exposure monitoring done on or for each employee and provided to the physician.
- Any employee medical complaints related to exposure to lead.
- Audiometric (hearing) test records of initial and periodic (at least annual) exams for each employee exposed above 85 dBA.

Certain records must be retained for specified periods:

- All employee medical records: at least the duration of employment, plus 30 years. (Workers who leave employment before 1 year may be given their records, under OSHA's regulation.)
- All employee exposure records, and analyses: at least 30 years.
- Background environmental monitoring data: at least 1 year, with the supporting information (sampling results and methodology) at least 30 years.
- Noise exposure measurements: at least 2 years.
- Audiometric test records: at least for the duration of a worker's employment.

For more information on requirements for retention, access and confidentiality regarding employee exposure and medical records refer to 29 CFR 1910.20(d)-(e) (and 29 CFR 1910.95(m) for hearing and noise records).

REFERENCES

1. National Institute for Occupational Safety and Health, Lead Exposure and Design Considerations for Indoor Firing Ranges. HEW Publication No. (NIOSH) 76-130, December 1975.
2. Department of the Army. Headquarters Letter 385-91-1, subject: Inspection and Evaluation of U. S. Army Indoor Firing Ranges, March 26, 1991.
3. National Rifle Association. Range Manual, a Guide to Planning and Construction. Washington, DC: National Rifle Association, 1989.
4. American Conference of Governmental Industrial Hygienists. Industrial Ventilation, Manual of Recommended Practice. 19th ed. Lansing, Michigan: American Conference of Governmental Industrial Hygienists, 1986.
5. U. S. Department of Labor. Occupational Safety and Health Administration. Safety and Health Regulations for Lead in General Industry. 29 CFR 1910.1025.
6. U. S. Department of Labor. Occupational Safety and Health Administration. Safety and Health Regulations for Occupational Noise Exposure in General Industry. 29 CFR 1910.95.
7. GSA Handbook ADM P 5940.1, GSA Occupational Safety and Health Program, February 26, 1992.

8. GSA Written Hazard Communication Program Standard Operating Procedure, March 1991; see reference 6.
9. GSA Selection, Care and Use of Respiratory Protection for Maintenance Work Standard Operating Procedure, March 1991; see reference 6.
10. U. S. Department of Labor. Occupational Safety and Health Administration. Access to Employee Exposure and Medical Records. 29 CFR 1910.120.
11. Schaeffer, D., R. Deem, E. Novak: Indoor Firing Range Air Quality: Results of a Facility Design Survey. American Industrial Hygiene Association Journal 51:84-88 (1990).

TABLE OF LEAD EXPOSURE LIMITS

Personnel Exposure Limits for Intermittent Lead Exposure

Airborne Lead Concentrations µg/m ³	Maximum Hours of Allowable Exposure Per Day	
	Firing 30 or more days per year	Firing Less than 30 days per year
0 - 30	8	8
30 - 40	6	8
40 - 50	4½	8
50 - 60	4	6½
60 - 80	3	5
80 - 100	2¼	4
100 - 150	1½	2½
150 - 200	1	2
200 - 300	¾	1 ¼
300 - 400	½	1
400 - 500	½	¾
500 - 750	¼	½
750 - 1000	¼	¼
1000	0	0

Note: The maximum allowable exposure hours should be halved for intermittent range users under 17 years of age. (For example, a 16-year old user firing 30 days per year with in a range with an airborne lead concentration of 125 µg/m³ should be in the range for no more than ¾ hours on any day.)

Figure 1
Table of Lead Exposure Limits

ATTACHMENT 1 - INITIAL INSPECTION CHECKLIST

INITIAL INSPECTION CHECKLIST FOR INDOOR FIRING RANGES

Location of indoor firing range:_____

1. Range was built in_____(month/year).

2. Range has an operational ventilation system:

- a. Make-up air inlets are provided and all are behind the firing line. If not provided, check No and Unsafe.

Yes____ No____ Safe____ Limited____ Unsafe____

- b. Air velocity at the firing line is 50-75 **fpm** for ventilation systems exhausting 100% behind the bullet trap. If No, check Limited.

Yes____ No____ Safe____ Limited____ Unsafe____

- c. Downrange transport velocity is 35 fpm or greater with no observable turbulence. If No, check Limited.

Yes____ No____ Safe____ Limited____ Unsafe____

- d. Exhaust air exceeds make-up air, range is maintained at a negative pressure. If No, check Limited, if exhaust is not working, check Unsafe.

Yes____ No____ Safe____ Limited____ Unsafe____

- e. Make-up air and exhaust systems are electrically interlocked. If No, check Limited.

Yes____ No____ Safe____ Limited____ Unsafe____

- f. Has lead sampling been accomplished? If no, sample as soon as possible.

Yes____ No____

3. Range has a working target retrieval system. If No, check Limited.

Yes___ No___ Safe___ Limited___ Unsafe___

4. Bullet stop is made of steel. If any material other than steel, check Unsafe.

Yes___ No___ Safe___ Limited___ Unsafe___

5. Steel bullet stop is in good condition, not bowed or pitted. If No, check unsafe.

Yes___ No___ Safe___ Limited___ Unsafe___

NOTE: If it appears holes in the backstop are caused by authorized weapons/ammunitions, thickness of steel should be checked against bullet stop specifications.

If it appears holes are caused by overshooting the range by use of large and higher velocity cartridges than those authorized, this indicates lack of range discipline.

If the possibility exists of shooting through the bullet-stop, building walls, floor, or ceiling, firing will be prohibited immediately until the limiting condition can be corrected.

6. Range has a venetian-blind type of bullet stop and forward edges of steel plates are maintained knife-sharp to prevent ricochets. If No, check Limited.

Yes___ No___ Safe___ Limited___ Unsafe___

7. Windows and/or door openings in front of the firing line are locked, barred, or protected. If no, check Limited or Unsafe as appropriate.

Yes___ No___ Safe___ Limited___ Unsafe___

8. List any other building envelope structural deficiencies that limit the use of the range or make it unsafe for use.

COMMENTS: Based upon the above findings, this range is classified as:
-UNSAFE - Any X in this category.
-LIMITED - Any X in this category limits use to conditions that must be specified.
-SAFE: Only X's in this category. Range is considered safe for all authorized firing.

ATTACHMENT 2 - INSPECTION CHECKLIST

INSPECTION CHECKLIST FOR INDOOR FIRING RANGES

Location of indoor firing range:_____

SECTION 1 - BUILDING ENVELOPE

1. Width of firing lanes is adequate (a minimum of four feet) to fire rifle and/or pistol. (Non-critical, but may present some operational problems, particularly when firing in the prone position.)

Yes___ No___ Remarks:

2. Single steel plate bullet stop with sand type trap (plate/sand trap) is set and an angle of 450 (+ or -5') from the vertical and inclined forward towards the firing line. (Critical only if it appears backscatter of lead particles results all the way back to the firing line.) [.22 Caliber firing (std).]

Yes___ No___ N/A___ Remarks:

3. Escalator bullet stop is set at an angle of 400 from the horizontal. (Critical only if it appears back scatter of lead particles results all the way back to the firing line.) [M1 6 firing.]

Yes___ No___ N/A___ Remarks:

4. Thickness of steel plate/sand trap type bullet stop is adequate to attenuate the maximum caliber of ammunition authorized to be fired on the range. (Critical only if bullet stop is damaged to the point where repair/replacement is necessary.)

Yes___ No___ Remarks:

DIMENSIONS OF ARMOR BACKSTOPS, SIDE PLATES AND BAFFLING PLATES

Caliber (up to)	Thickness of Backstops (minimum)	Thickness of Side Plates (minimum)	Thickness of Steel plate in Baffling
.22 S/LR	1/4" at 45°	3/16"	3/16" at 30°
.38 wadcutter	3/8" at 45°	1/4"	1/4" at 30°
.45	1/2" at 45°	3/8"	3/8" at 30°
5.56mm (M193)	5/8" steel plate w/8" reinforced concrete	3/8"	3/8" at 30°
5.56mm(M855)	1 " hardened steel plate permanently affixed to backstop w/1" armor plate facing	armor plate 1"	armor plate at 30°

5. Plate/sand trap type bullet stop is properly installed and joints and edge lines backed with a continuous 1/4" thick steel backing plate 4" in width or wider. (Critical if missing and joints and edge lines show signs of bullet damage.)

Yes___ No___ Remarks:

6. Plate/sand trap bullet stop is suspended by angle braces faced with wood to prevent ricochets or backscatter. (Critical only if braces show signs of bullet damage.)

Yes___ No___ Remarks:

7. Bullet stop sidewalls are of steel or covered with steel plate. (Critical only if there is evidence of plate being punctured by bullets.)

Yes___ No___ Remarks:

8. Plate/sand trap type side plates extend vertically downward from the top edge of the bullet stop to the bottom of the sandpit to the bottom rear edge of the bullet stop. (Critical to protect building and adjacent areas.)

Yes___ No___ Remarks:

9. Sideplates extend vertically downward from the top edge of the bullet stop to the bottom rear edge of the bullet stop. (Critical to protect building and adjacent areas.)

Yes___ No___ Remarks:

10. In high ceiling buildings where the plate/sand trap type of bullet stop has been installed, the rear wall above the stop is lined with 2" of wood (or 2 sheets of 3/4" plywood over a 1/8" steel plate) to prevent shooting through the rear wall.

Yes___ No___ N/A___ Remarks:

11. Pitted or bowed steel bullet stop plates are repaired by cutting out the damage piece and welding in a new piece. (Critical to the extent that this condition may result in ricochet, backsplatter or damage to building walls.)

Yes___ No___ N/A___ Remarks:

12. Welds are ground smooth to prevent backsplatter.

Yes___ No___ Remarks:

13. Forward leading edges in a louver or venetian-blind type of bullet stop are maintained "knife-sharp" to prevent ricochets. (Critical where leading edges are blunted and cause ricochets or backsplatter.)

Yes___ No___ Remarks:

14. On a plate/sand type of range targets are not suspended in front of plate seams or welds. (Noncritical, except where seam/weld is damaged.) Reposition or relocate targets to correct.

Yes___ No___ Remarks:

15. Pipes, conduit, lights fixtures and other projecting surfaces in front of the firing line are baffled or cover with 3/4 inch plywood (if applicable), (Critical to protect items mentioned above and reduce maintenance costs.)

Yes___ No___ N/A___ Remarks:

16. Side wall windows or doors in front of the firing line are bricked in, baffled or otherwise protect with wood or steel. (Critical to prevent shooting outside of the building.)

Yes___ No___ N/A___ Remarks:

17. On plate/sand type ranges width of sandpit is determined to be adequate by dropping a plumb line from the edge of the bullet stop to the floor. (Necessary to prevent damage to the floor.)

Yes___ No___ N/A___ Remarks:

18. Special Situation Comments:

- a. Range floor is constructed of wood and there is a room below, the floor in front of the firing line for at least 8 feet is cover with steel plate of 3/16 inch minimum thickness of .22 caliber and 1/4 inch of .38 and .45 caliber ranges. (Where used, steel plate must be covered with a nonskid composition floor covering such as linoleum.)

Yes___ No___ N/A___ Remarks:

- b. Wooden floor at firing line is covered with a non-skid composition floor covering to prevent powder from accumulating in cracks and presenting a fire hazard.

Yes___ No___ N/A___ Remarks:

- c. Wooden ceiling is protected for 10 feet in front of firing line (extending from the firing line to the first baffle) and 10 feet in back of firing line with 3/16" steel plate covered with 2 inch douglas fir planking or one sheet of 3/4" douglas fir plywood for .22 caliber and 1/4" steel plate for .38 and .45 caliber faced with 2 inches of douglas fir planking or two sheets of 3/4" plywood. (Mandatory when applicable.)

Yes___ No___ N/A___ Remarks:

18. d. Ceiling baffles are constructed and positioned properly to prevent shooting into ceiling. (Mandatory where ceiling design only uses one ceiling target light and no ceiling baffles.)

Yes___ No___ N/A___ Remarks:

- e. Ceiling baffles are placed so they do not restrict vision or interfere with operation of the target carrier system.

Yes___ No___ Remarks:

- f. Partitions or baffles extending from floor to ceiling between firing positions are used only when all positions are visible from the control point. (Mandatory, but generally applies to older ranges.)

Yes___ No___ N/A___ Remarks:

-
19. Plate/sand trap type range - sandbagging, heavy padding or other means are used on the back of the bullet stop to reduce impact noise.

Yes___ No___ N/A___ Remarks:

-
20. Range illumination eliminates undesirable contrasts between bright target and dark surroundings. Fifty foot-candles or more is desired. (Desirable, but noncritical.)

Yes___ No___ Remarks:

-
21. Lower edges of overhead lighting protection baffles do not interfere with shooters' seeing uprange. (Critical - shooters cannot hold a correct sight picture if they must bend over to see under the baffles. Applies to handgun and off-hand rifle shooting.)

Yes___ No___ Remarks:

-
22. On pistol ranges, center of target is on a line extended 5% above firing position to and through the target. (Noncritical, but a height below or above this makes it more difficult to hit the target.)

Yes___ No___ N/A___ Remarks:

23. On rifle and pistol ranges target heights of 18" and 5' are provided. (Noncritical, but desirable.)

Yes___ No___ Remarks:

24. Target holders are constructed of round bar metal stock without any flat surfaces exposed to the firing line. (Exposed flat surfaces can cause ricochet or backsplatter.)

Yes___ No___ Remarks:

25. Targets are numbered to coincide with numbered firing positions. (Essential to ensure firing on proper target.)

Yes___ No___ Remarks:

26. Range is equipped with a floor drain and trap to facilitate cleaning by wet methods.

Yes___ No___ Remarks:

SECTION II - ENVIRONMENTAL CONSIDERATIONS

27. An industrial hygienist or mechanical engineer has determined that the installed ventilation system is acceptable. This determination shall be based on measurement of exhaust and supply air volumes, air velocity at the firing line, downrange transport velocity, and observation of turbulent flow.

Yes___ No___ Remarks:

NOTE: When the ventilation is inadequate, the range must be closed or exposure controlled per Table of Lead Exposure Limits until corrective action is taken.

28. Personnel assigned or detailed to work in the firing range on a permanent basis are enrolled in a Medical Surveillance program and in a Hearing Conservation Program.

Yes___ No___ Remarks:

NOTE: Personnel will not be permitted to work in firing range unless the foregoing medical requirements are satisfied.

SECTION III - OPERATIONAL SURVEY

29. Plate/sand trap type bullet stop has a layer of clean sand used to catch deflected lead 6" to 8" deep running the width and in front of the stop. (Required to attenuate bullets, prevent ricochet and backscatter.)

Yes___ No___ Remarks:

30. Sand is screened regularly to remove lead and reduce the possibility of backscatter. Lead analysis is required before disposal of sand. (Frequency of firing will determine amount of lead bullet-mass buildup and frequency of cleaning required.)

Yes___ No___ Remarks:

31. When using a sand-filled "crib" type of bullet-stop, slope is maintained at a 1:1 slope ratio. (This will provide best bullet attenuation.)

Yes___ No___ N/A___ Remarks:

32. Door opening into the range (from the outside or adjacent rooms) in front of the firing line are secured from the inside to prevent personnel from entering while firing is in progress. (Mandatory from a life safety standpoint. Where possible, doors should be locked/secured and keys controlled.)

Yes___ No___ Remarks:

33. Ventilation system is in operation when range is in use and during cleanup. (Mandatory - no exceptions.)

Yes___ No___ Remarks:

34. Cleaning of the range is accomplished by vacuuming or wet methods. HEPA filters are required on vacuum cleaners. (Dry cleaning methods, i.e., use of a hand broom with or without sweeping compound, are prohibited.)

Yes___ No___ Remarks:

35. Personnel assigned or detailed to work in the range are required to wear a NIOSH approved respirator, equipped with HEPA filters for the removal of lead dust and fumes, while cleaning, repairing or reclaiming lead from the bullet trap. (Mandatory.)

Yes___ No___ Remarks:

36. Smoking and/or the consumption of food/beverage in the range is prohibited to preclude the ingestion of lead into the body. (Should be included in prefiring orientation and appropriate signs should be posted.)

Yes___ No___ Remarks:

37. Shooters are advised to wash hands thoroughly after firing.

Yes___ No___ Remarks:

38. All personnel permitted in the range during weapons firing are required to wear appropriate hearing protection devices, i.e., shooters, coaches, spectators, (where permitted) and assigned/detailed operating personnel. (Failure to comply is basis for removal from range.)

Yes___ No___ Remarks:

39. Personnel assigned to or employed full-time at the range, are enrolled in a hearing conservation program. (Mandatory - base level audiogram must be made prior to beginning work in the range and at least annually thereafter.)

Yes___ No___ Remarks:

40. No drapery is present at the firing range. (Noise attenuation capability of drapery is questionable, and it collects lead dust.)

Yes___ No___ Remarks:

41. Range signs are posted denoting caution in handling weapons and stating the conditions under which the range may be used, including weapons and ammunition authorized to be fired. (Mandatory.)

RANGE SIGNS

- a. An easily read "Caution" sign is prominently posted near the firing line of each indoor range.

Yes___ No___ Remarks:

- b. The sign should carry the following message with wording modified, as appropriate, for the caliber of ammunition and types of weapons authorized. For example:

CAUTION! USE OF THIS RANGE FACILITY IS RESTRICTED TO SUPERVISED FIRING WITH (*Select from the following:* RIFLE CAL. 22; PISTOL CAL. 22; PISTOL CAL. 38; PISTOL CAL. 45) WITH SOFT NOSED LEAD OR LEAD ALLOY AMMUNITION ONLY.

Yes___ No___ Remarks:

- c. Large numbers, indicating target position, are painted on the top of the steel plate bullet stop above the top target position, or on wooded boards installed above the top of the bullet stop plate, or on front backing material above the targets.

Yes___ No___ Remarks:

- d. Signs specifying who may use the range, under what conditions, and under what controls are posted.

Yes___ No___ Remarks:

42. Signs are posted requiring all personnel to wear hearing protection. (Mandatory.)

Yes___ No___ Remarks:

43. Quick draw type firing and/or hip shooting is prohibited. (Mandatory.)

Yes___ No___ Remarks:

44. Only authorized paper targets are used. (Use of nonstandard targets can produce ricochets.)

Yes___ No___ Remarks:

45. Where space permits and spectators are authorized, they are physically separated by a railing from the firing line (Mandatory to preclude any interference with firing controls.)

Yes___ No___ Remarks:

SECTION IV - REMARKS

Name of Inspector:_____

Signature of Inspector:_____

Company/Agency:_____

Telephone: (_____) _____

Date of Survey:_____